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Pain in Parkinson's Disease: Fluctuation and Impact on Quality of Life

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Abstract

Background: Parkinson's disease (PD) is a chronic, progressive neurodegenerative disorder known for its motor and non-motor symptoms. Among the non-motor symptoms, pain is highly prevalent, significantly affecting patients' quality of life. Pain in PD can manifest in various forms, including musculoskeletal, dystonic, and neuropathic pain. Despite its high prevalence, pain in PD is often under-recognized and undertreated, necessitating further exploration of its characteristics and impact on quality of life. This study aims to assess the prevalence, types, and fluctuation of pain in PD patients and their relationship with motor and non-motor symptoms.

Patients and Methods: This cross sectional study was conducted on 40 PD patients at Movement Disorders clinic in Ain Shams University. Data collection included demographic characteristics, medical history, and evaluation using standardized scales such as the King's Parkinson's Disease Pain Scale (KPPS), Movement Disorder Society–Unified Parkinson's Disease Rating Scale (MDS-UPDRS), Non-Motor Symptoms Scale (NMSS), and the Parkinson's Disease Questionnaire (PDQ-39). The correlation between these scales and the severity of pain was analyzed.

Results: The study revealed a statistically significant correlation between KPPS and the wearing-off phenomenon (R=0.349, p=0.027), highlighting the association between motor fluctuations and pain severity. However, no significant correlations were found between KPPS and other scales like NMSS, Pittsburg Sleep Quality index (PSQI), MDS-UPDRS, or PDQ-39 summary index. Pain was highly prevalent among PD patients, with musculoskeletal and fluctuation-related pain being the most common types.

Conclusion: Pain is a frequent and impactful non-motor symptom in Parkinson's disease that substantially affects patients' quality of life. The correlation between pain and motor fluctuations such as wearing off suggests that optimizing dopaminergic therapy could help manage pain in PD. Further studies are recommended to explore the management strategies for pain in PD and its complex interaction with other non-motor symptoms.

Key Words: *Parkinson's disease – Pain – Quality of life – Non-motor symptoms – Fluctuations.*

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Introduction

WITH increasing awareness of pain in Parkinson's disease (PD), it is clear that this non-motor symptom can play a significant role in the quality of life in these individuals **[1,2].**

Pain in PD is classified into five categories with different pathophysiology including musculoskeletal, radicular, neuropathic, dystonic, and akinetic. The origin of neuropathic and musculoskeletal pain may be dysfunction in the sensory processing system (i.e. basal ganglia-thalamocortical pathway) and abnormal posture or rigidity in these individuals, respectively **[3].**

Dystonic and akinetic pain are the main source of pain during medication fluctuations specially in the early morning and the off-drug phase **[4,5].**

Pain is much prevalent in Parkinson's patients, nearly 68–85% of people with PD report different kinds of pain. This necessitates physicians and movement disorders specialists to design appropriate treatment protocols for the management of pain. **[6].**

Patients and Methods

This cross-sectional study involved 40 patients diagnosed with idiopathic Parkinson's disease, as per the MDS 2015 criteria **[7]**, who were followed up at the Movement Disorders Clinic of Ain Shams University Hospital between April – October 2023.

Inclusion criteria: Patients included in the study were between 18 and 80 years old of both genders, fully conscious, oriented, and attentive, compliant on anti-Parkinson medications.

Exclusion criteria: Individuals were excluded if they had a diagnosis of atypical Parkinsonian disorders (e.g., Dementia with Lewy Bodies, Progressive Supranuclear Palsy, Multiple System Atrophy, Corticobasal Syndrome), secondary parkinsonism to brain injury, encephalitis, HIV/AIDS, meningitis, stroke, Wilson's disease, or if they presented psychiatric disease.

All patients underwent a comprehensive assessment, including a detailed medical history that encompassed demographics (age, sex, age at onset of PD, disease duration) and specific symptoms such as wearing off, dyskinesia, REM sleep behavior disorder, and visual hallucinations.

MRI brain was done for all patients to exclude secondary causes and potential atypical Parkinsonism.

Assessment tools:

Participants were evaluated using several standardized scales and questionnaires Quality of Life in Parkinson's Disease Questionnaire (PDQ-39) *[8]*: Consists of 39 items divided into eight dimensions or subscales. Each item is scored on a scale from 0 (never) to 4 (always), reflecting how often the patient experiences a particular issue.

PDQ-39 Scoring Process: Subscale Scores: There are eight subscales, and each consists of several questions: Mobility (MOB): 10 items, activities of Daily Living (ADL): 6 items, emotional Well-being (EMO): 6 items, Stigma (STI): 4 items, Social Support (SOC): 3 items, Cognition (COG): 4 items, Communication (COM): 3 items and bodily Discomfort (DIS): 3 itemsand PDQ-39 Summary Index (SI) *[8]*: The Summary Index is the average of the transformed scores across all eight subscales. All Patients underwent the Movement Disorder Society-Unified Parkinson's Disease Rating Scale (MDS-UPDRS) *[9]*. The stage and severity of PD was assessed according to Unified Parkinson's disease rating scales (UPDRS) III, V, and VI, Pittsburgh Sleep Quality Index (PSQI) *[10]*: This self-report questionnaire consists of 19 individual items that generate seven component scores: Subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, Sleep disturbances, use of sleeping medication and Daytime dysfunction, King's Parkinson's Disease Scale: The KPPS, a rater-interview-based scale with the patient (helped by the caregiver if needed) addressed to determine localization, intensity, and frequency of pain and its relationships with motor fluctuations or musculoskeletal pain. A total KPPS score is obtained from the sum of the items' scores (theoretical range: 0–168) and represents the symptomatic burden by pain *[11]*, Non-Motor Symptoms Questionnaire, Non-Motor Fluctuation Assessment Questionnaire, Wearing Off Questionnaire (WOQ-19) *[12]*: The WOQ-19 is designed to help clinicians understand how frequently and severely these symptoms occur.

Imaging: Plain X-ray imaging of the cervical and lumbosacral spine was performed for all patients. Both oblique and lateral views were obtained to assess any potential spinal abnormalities that might contribute to pain or motor symptoms.

Ethical considerations:

The study adhered to the Declaration of Helsinki, and informed consent was obtained from all participants before inclusion. Patient confidentiality was ensured throughout the research process, with data anonymized prior to analysis.

Statistical analysis:

Data processing and analysis were performed using the Statistical Package for Social Sciences (SPSS) software version 22.0 (IBM Corp., Chicago, USA, 2013). Descriptive statistics were used to summarize patient characteristics and questionnaire scores. Inferential statistics were applied to explore relationships between variables and to compare subgroups within the study population.

Declarations:

This Manuscript was written according to the STROBE Statement Checklist *[13]*. And The study adhered to the Declaration of Helsinki, and informed consent was obtained from all participants before inclusion. Patient confidentiality was ensured throughout the research process, with data anonymized prior to analysis.

This study has been ethically approved by Ain Shams University under the study identifier number FMASU MS 172/2023. Moreover, it is not applicable for funding. This manuscript is posted as a preprint in Research Square with a DOI https://doi.org/10.21203/rs.3.rs-5299896/v1. This work is licensed under a CC BY 4.0 License.

Authors contributions:

- M.M. collected the data, performed patient assessments using the scales, and drafted the main manuscript text.
- N.E. revised the manuscript and analyzed the statistical data and results.
- S.K. reviewed the manuscript and ensured the accuracy of the references.
- A.E. contributed to data collection and co-authored the manuscript.
- A.M. developed the main idea, selected the assessment scales, evaluated all patients to confirm diagnoses, collected the data, and wrote the main manuscript text.

All authors reviewed and approved the final version of the manuscript.

Conflict of interest status:

The authors have no competing interests as defined by Springer, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

Consent for publication:

All participants consented to the publication of anonymized results. Any identifiable personal information, such as names or specific images, has been omitted to ensure participant privacy. Participants were made aware that the study's findings may be published in scientific journals or presented at conferences, but no identifying information will be included. They provided written consent allowing the publication of their de-identified data.

Availability of data and materials:

The data supporting the findings of this study are available from the corresponding author upon reasonable request. Data access is restricted to protect participant privacy and confidentiality in accordance with ethical guidelines. However, de-identified data sets may be shared with qualified researchers upon request for academic purposes. Interested researchers can contact the corresponding author for data access inquiries.

Results

The demographic data reveals that the studied population is predominantly male (92.5%), with an average age of approximately 57 years (range: 23–75 years). Moreover, this cross sectional study presents a significant burden of comorbidities, with 17.5% of participants having diabetes mellitus (DM) and 32.5% diagnosed with hypertension. Additionally, Regarding pain distribution, it was demonstrated that radicular pain was the most frequent followed by musculoskeletal and orofacial pain (80%, 70% & 30%, respectively) (Table 1).

Table (1): Demographic, medical history of studied cases and pain distribution among studied cases.

	N=40	%
Age / years	56.98±11.61 (23-75)	
Sex:		
Male	37	92.5
Female	3	7.5
DM:		
–ve	33	82.5
+ve	7	17.5
Hypertension:		
–ve	27	67.5
+ve	13	32.5
Muscloskeletal	28	70.0
Radicular	32	80.0
Oro-Facial	12	30.0

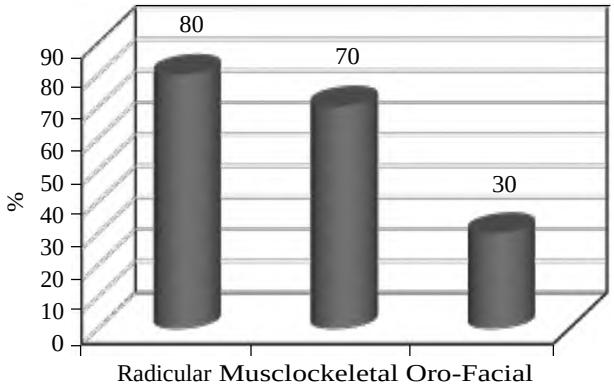

Fig. (1): Pain site distribution among studied cases.

Table (2) Descriptive findings of studied scales.

Non-motor fluctuations and non-motor symptom severity (NMSS) appear as notable concerns, with mean scores of 15.4 and 30.2, respectively. These scores suggest that non-motor symptoms are significantly affecting quality of life. Additionally, the sleep quality (PSQI) mean score of 6.7 indicates poor sleep quality in this population, which is a grave condition and can contribute to pain and poor quality of life in those patients.

	N=40
Non motor fluctuation	15.4±3.68 (4-20)
NMSS	30.20±3.17 (25-33)
PSQI	6.7±1.51 (5-9)
KING'S PD	25.15±2.05 (21-29)
MDS-UPDRS	24.48±14.99 (10-73)
LED	602.85±284.10 (100-1300)
PDQ-39 summary index	42.48±22.99 (2.18-76.12)
Wearing off	31.13±8.62 (10-45)

Table (3) comparison between different types of pain regarding the studied parameters.

Regarding musculoskeletal pain; a statistically significant higher mean NMSS, MDS-UPDRS, PDQ-39 summary index and wearing off among cases with musculoskeletal pain. Among cases with radicular; a statistically significant higher mean MDS-UPDRS, PDQ-39 summary index and wearingoff. Similarly, cases with orofacial pain illustrates statistically significant higher mean MDS-UPDRS, PDQ-39 summary index and wearing off.

	Musculoskeletal		Radicular		Oro-Facial	
	Absent (n=12)	Present (n=28)	Absent (n=8)	Present (n=32)	Absent (n=28)	Present (n=12)
NMSS	27.75±2.93	31.25±2.68	29.25±3.45	30.44±3.11	29.71±3.26	31.33±2.74
• *p*-value	0.001*		0.350		0.141	
PSQI	6.50±1.24	6.79±1.62	6.75±1.58	6.69±1.51	6.71±1.61	6.67±1.30
• *p*-value	0.589		0.918		0.928	
KING'S PD	24.50±2.11	25.43±1.99	24.75±2.49	25.25±1.95	24.93±1.76	25.67±2.61
• *p*-value	0.192		0.543		0.302	
MDS-UPDRS	14.33±4.5	28.82±15.85	14.38±5.09	27±15.63	19.61±9.79	35.83±19.0
• *p*-value	0.004*		0.03*		0.001*	
LED	585.25±324.76	610.39±270.96	675.0±431.8	584.81±240.3	603.18±300.98	602.08±252.59
• *p*-value	0.801		0.429		0.991	
PDQ-39 summary index	18.39±17.95	52.80±16.24	25.79±20.77	46.66±21.85	34.32±22.45	61.53±8.47
• *p*-value	0.001*		0.02*		0.001*	
Wearing off	24.67±8.8	33.89±7.02	21.88±9.34	33.44±6.79	28.61±8.23	37.0±6.56
• *p*-value	0.001*		0.001*		0.003*	

Used test: Student *t*-test. Data expressed as Mean ± SD. *Statistically significant.

Table (4) correlation between KING'S PD and other assessed scales.

This table illustrates statistically significant positive correlation between KING'S PD and wearing off (r=0.349, p=0.027). A non-statistically significant correlation was detected between KING'S PD and the following; NMSS (p=0.062), Non motor fluctuation (p=0.262), PSQI (p=0.981), MDS-UPDRS (p=0.176), LED (p=0.867) and PDQ-39 summary index (p=0.227).

	KINGS' PD	
	r	*p*
NMSS	0.298	0.062
Non motor fluctuation	0.182	0.262
PSQI	–0.004	0.981
MDS-UPDRS	0.218	0.176
LED	0.027	0.867
PDQ-39 summary index	0.195	0.227
Wearing off	0.349	0.027*

(Table 5) correlation between Non motor fluctuation and all other studied scales.

Significant correlations were observed between non-motor fluctuations and NMSS (r=0.546, p<0.001), PDQ-39 summary index (r=0.512, p=0.001), and wearing off (r=0.461, p=0.003). These findings highlight the substantial impact of non-motor fluctuations on overall disease burden and quality of life, emphasizing the need for comprehensive management of non-motor symptoms.

	Non motor fluctuation	
	r	*p*
NMSS	0.546	<0.001*
PSQI	0.139	0.393
KING'S PD	0.182	0.262
MDS-UPDRS	0.302	0.06
LED	0.162	0.317
PDQ-39 summary index	0.512	0.001*
Wearing off	0.461	0.003*

r: Spearman correlation coefficient. *Statistically significant.

Table (6) correlation between Wearing off and all other studied scales.

Wearing off showed significant positive correlations with King's Parkinson's scale which reflect that significant portion of pain arise during off condition, NMSS, non-motor fluctuations, MDS-UPDRS, and PDQ-39 summary index, which ensure the impact of fluctuation on quality of life and that it is part of the disease course.

	Wearing off	
	r	*p*
NMSS	0.465	0.003*
Non motor fluctuation	0.461	0.003*
PSQI	0.042	0.796
KING'S PD	0.349	0.02*
LED	0.130	0.423
MDS-UPDRS	0.803	0.001*
PDQ-39 summary index	0.717	0.001*

r: Spearman correlation coefficient. *Statistically significant.

Table (7) correlation between NMSS and all other studied scales.

This table shows a statistically significant positive correlation between NMSS and the following scales: MDS-UPDRS (r=0.337, p=0.03), PDQ -39 Summary Index (r=0.402, p=0.01), and Wearing Off (r=0.465, p=0.003). However, no statistically significant correlation was observed between NMSS and PSQI (p=0.661), KING'S PD (p=0.062), or LED (p=0.131).

	NMSS	
	r	*p*
PSQI	0.071	0.661
KING'S PD	0.298	0.062
MDS-UPDRS	0.337	0.03*
LED	0.243	0.131
PDQ-39 summary index	0.402	0.01*
Wearing off	0.465	0.003*

r: Spearman correlation coefficient. *Statistically significant.

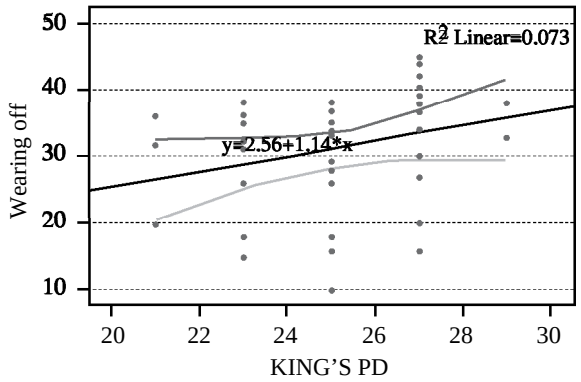

Fig. (2): Scatter diagram showing correlation between wearing off and KING'S PD among studied cases.

Table (8) correlation between PDQ summary index and all other studied scales.

It shows statistically significant positive correlation between PDQ-39 summary index and the following; NMSS (r=0.402, p=0.01), Non motor fluctuation (r=0.512, p=0.001), MDS-UPDRS (r=0.665, p=0.001) and Wearing off (r=0.717, p=0.001). However; no statistically significant correlation was detected between PDQ summary index and the following; PSQI (p=0.625), KING'S PD (p=0.227) and LED (p=0.258).

	PDQ summary index	
	r	*p*
NMSS	0.402	0.01*
Non motor fluctuation	0.512	0.001*
PSQI	-0.08	0.625
KING'S PD	0.195	0.227
LED	0.183	0.258
MDS-UPDRS	0.665	0.001*
Wearing off	0.717	0.001*

r: Spearman correlation coefficient. *Statistically significant.

Table (9) correlation between LED and all other studied scales.

Shows no statistically significant correlation between LED and the following; NMSS (p=0.131), Non motor fluctuation (p=0.317), PSQI (p=0.462), KING'S PD (p=0.867), MDS-UPDRS (p=0.900), PDQ-39 summary index (p=0.258), and Wearing off (p=0.423).

	LED	
	r	*p*
NMSS	0.243	0.131
Non motor fluctuation	0.162	0.317
PSQI	0.120	0.462
KING'S PD	0.027	0.867
MDS-UPDRS	0.02	0.900
PDQ-39 summary index	0.183	0.258
Wearing off	0.130	0.423

r: Spearman correlation coefficient.

Discussion

This study aimed to investigate the prevalence and characteristics of pain, its relationship to wearing off, and the impact of pain on the quality of life (QoL) in Parkinson's disease (PD) patients. Our findings, using a cross-sectional design and a comprehensive assessment of motor and non-motor symptoms, provide further insight into the complex relationship between pain and PD.

Prevalence and types of pain:

Our results indicated that pain is highly prevalent in our sample, with 80% of participants experiencing radicular, musculoskeletal, or orofacial pain **[1]**. These findings align with previous studies that have reported a wide range of pain prevalence in PD, from 30% to 83% **[14,15]**.

Specifically, musculoskeletal pain was the most common type of pain in our study, at 70%, followed by radicular pain, at 80% and orofacial pain at 30%. This is consistent with other studies which have also reported musculoskeletal pain as the most prevalent type of pain in PD **[14,16,17]**.

Impact of pain on quality of life:

Our study found a statistically significant positive correlation between the Parkinson's Disease Questionnaire (PDQ-39) summary index and the Non-Motor Symptoms Scale (NMSS), non-motor fluctuations, the Unified Parkinson's Disease Rating Scale (MDS-UPDRS), and wearing-off. This indicates that patients with higher non-motor symptom burden, more non-motor fluctuations, greater disease severity, and more severe wearing off experience poorer quality of life.

Notably, there was no statistically significant correlation between the PDQ-39 summary index and the King's PD pain scale, which may suggest that QoL was impacted more by other factors.

These findings underscore that pain is a significant factor affecting QoL and is closely linked with other PD symptoms, which is consistent with previous research *[17-20]*.

Pain and wearing off:

We observed a statistically significant correlation between wearing off and pain. There was a significant correlation between wearing off and NMSS (r=0.465, p=0.003), non-motor fluctuations (r=0.461, p=0.003), and the King's PD scale (r=0.349, p=0.02).

This relationship suggests that fluctuations in motor and non-motor symptoms, including pain, are linked to the wearing-off phenomenon of levodopa. This highlights the importance of monitoring and managing wearing-off to improve pain control *[14,21,22]*.

Our study also revealed a significant correlation between the wearing off and the MDS-UPDRS (r=0.803, p=0.001), suggesting that more severe motor symptoms may be associated with more pronounced wearing-off effects.

Our results also found that non-motor fluctuations had a significant correlation with the PDQ-39 summary index (r=0.512, p=0.001), which indicates that non-motor symptoms impact quality of life.

These findings suggest that fluctuating pain may be an independent clinical subtype of PD that warrants specific attention and aggressive treatment strategies, potentially including device-assisted therapies like deep brain stimulation or levodopa-carbidopa intestinal gel *[19]*.

Levodopa equivalent dose and pain:

Our findings showed no statistically significant correlation between the LED and QoL, as measured by the PDQ-39, which is consistent with some previous findings that showed no association between levodopa dosage and the prevalence or severity of radicular neuropathic pain *[16,20]*.

The lack of association suggests that levodopa may not fully address all types of pain in PD, highlighting the need for additional pain management approaches.

Further research is needed to explore the complex relationship between dopaminergic treatment and different types of pain in PD.

The King's PD Pain Scale (KPPS):

While our study did not find a statistically significant correlation between the KPPS and quality of life, the fact that this tool was used in our study allows us to add to the growing body of evidence supporting the validity and reliability of this pain assessment tool in PD *[23]*.

The KPPS provides a comprehensive assessment of pain in PD, which allows for the identification of the various types of pain in these patients and the impact of pain on their lives.

Our findings support the view that a specific pain assessment tool like the KPPS should be used more often in clinical practice to accurately assess pain in PD.

Limitations:

This study has some limitations that should be taken into consideration when interpreting the results.

- The cross-sectional nature of our study does not allow for causal relationships to be established.
- The sample size is small, which may impact the generalizability of our findings.
- We did not assess depression and anxiety, which are known to influence pain perception.
- We did not control for other pain-related conditions, which could affect the results.

Future directions:

Our findings reinforce the need for a more comprehensive approach to pain management in PD. Future research should explore:

- The underlying mechanisms of different pain types in PD.
- The effectiveness of different treatment strategies for specific types of pain in PD.
- The impact of different PD subtypes on the prevalence and characteristics of pain.
- The potential for personalized pain management strategies considering the diverse nature of pain in PD.

Conclusion:

In conclusion, this study reinforces the significant impact of pain on the quality of life of PD patients and underscores the complex relationships between pain, wearing off, motor and non-motor symptoms. Pain is a significant, non-motor symptom of Parkinson's Disease, that is underreported and undertreated, and it is critical that pain be addressed for a better quality of life for people with PD. Our study highlights the need for a comprehensive assessment of pain using validated tools like the KPPS, and suggests that monitoring and managing wearing-off may improve pain control. Future studies are needed to develop more effective pain management strategies tailored to the diverse needs of patients with PD.

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الألم فى مرض باركنسون: التقلب والتأثير على جودة الحياة

يعد الألم فى مرض باركنسون من الأعراض غير الحركية التى تؤثر على نوعية الحياة. يمكن تصنيف الألم إلى ألم عضلى هيكلى، وجذرى، وعصبى، ودوائى، وحركى. يعاني حوالى ٦٨–٨٥٪ من الأشخاص من الألم، مما يتطلب بروتوكولات علاجية مخصصة. يعد مقياس ألم مرض باركنسون، الذى تم تطويره فى عام ٢٠١٥، أداة تعتمد على الرأى لتقييم الألم. وهو يقيس شدة الألم وتكراره فى سبعة نطاقات وله خصائص سيكومترية مقبولة. لكن هناك حاجة إلى مزيد من الدراسات بلغات أخرى لتعميم النتائج وزيادة استخدامها.

الهدف من الدراسة: تهدف هذه الدراسة إلى تحليل خصائص مقياس كينجس للألم لمرض باركنسون وتحديد النقاط الحاسمة لشدة الألم لدى المصريين المصابين بالمرض. تم إجراء الدراسة الملاحظة المستقبلية فى عيادة اضطرابات الحركة فى مستشفى عين شمس الجامعى على ٤٠ مريضًا من مرضى باركنسون فى كلية الطب بجامعة عين شمس.

أظهرت النتائج الرئيسية للدراسة مايلى:

النتائج: تظهر أن متوسط عمر المشاركين هو ٥٦,٩٨ عامًا، مع وجود نسبة كبيرة من الذكور (٥,٩٢٪)، و٥,١٧٪ منهم مصابون بالسكرى و٥,٣٢٪ يعانون من ارتفاع ضغط الدم. الألم الجذرى هو الأكثر شيوعًا بين الأعراض، يليه الألم العضلى الهيكلى وألم الوجه. كما تم تقديم متوسطات لعدة مقاييس تتعلق بالحالة الصحية، مثل تقلبات غير الحركية، ودرجات مختلفة تتعلق بجودة الحياة والأعراض، مع توضيح نطاقات هذه القيم.

يوضح النص وجود ارتباط إيجابي ذو دلالة إحصائية بين KING'S PD وجرعه الدواء، بينما لا توجد ارتباطات ذات دلالة إحصائية مع عدة عوامل أخرى مثل NMSS وPSQI. كما يُظهر MDS–UPDRS (مقياس تقييم مرض باركنسون الموحد لجمعية اضطرابات الحركة) ارتباطات إيجابية ذات دلالة إحصائية مع (مقياس الاعراض الغير حركيه) NMSS وملخص PDQ وجرعه الدواء، بينما لا توجد ارتباطات ذات دلالة مع عوامل أخرى مثل NMSS وKING'S PD.

نتائج دراسة حول العلاقة بين جرعه الليفيدوبا المجمعه LED وبعض المتغيرات الأخرى ,تشير النتائج إلى عدم وجود ارتباط ذو دلالة إحصائية بين LED وعدد من المتغيرات مثل NMSS وPSQI وKING'S PD وغيرها. بالمقابل، تم العثور على ارتباط إيجابى ذو دلالة إحصائية بين NMSS وجرعه الدواء، بينما لم تُظهر NMSS ارتباطًا ذو دلالة مع PSQI وKING'S PD وMDS–UPDRS و LED.

نتائج دراسة تتعلق بالعلاقات الإحصائية بين ملخص PDQ (استبيان باركينسون) أظهرت النتائج وجود ارتباط إيجابى ذو دلالة إحصائية بين ملخص PDQ وكل من MDS–UPDR, NMSS، جرعه الدواء، بينما لم يظهر أي ارتباط ذو دلالة مع LED, KING'S PD, PSQI كما أظهرت النتائج أيضًا وجود ارتباط إيجابى ذو دلالة إحصائية بين جرعه الدواء وMDS، NMSSKING'S PD–، وملخص PDQ، بينما لم يكن هناك ارتباط ذو دلالة مع KING'S PD ،PSQI، وLED.

وجود ارتباط إيجابى ذو دلالة إحصائية بين NMSS وMDS–UPDRS، وملخص PDQ، وجرعه الدواء، بينما لم يُظهر أى ارتباط ذو دلالة إحصائية مع KING'S PD ،PSQI، وLED. كما يُشير إلى عدم وجود ارتباط ذو دلالة إحصائية بين PSQI وعدد من المتغيرات الأخرى مثل KING'S PD وMDS–UPDRS وLED وملخص PDQ وجرعه الدواء.

تشير النتائج إلى عدم وجود فرق ذو دلالة إحصائية بين الذكور والإناث في جميع المعلمات المدروسة، مثل NMSS وPSQI و MDS–UPDRS وغيرها. ومع ذلك، يُظهر الأشخاص الذين يعانون من الألم العضلي الهيكلى ارتفاعًا ذو دلالة إحصائية فى متوسط NMSS وMDS–UPDRS وملخص PDQ وجرعه الدواء. كما أن الحالات التى تعانى من الألم الجذرى وألم الوجه تُظهر أيضًا ارتفاعًا ذو دلالة إحصائية فى نفس المعلمات. فى المقابل، لا يوجد فرق ذو دلالة إحصائية بين الذكور والإناث فيما يتعلق بأنواع الألم المختلفة.