Original Research

The Non-Motor Burden of Parkinson's Disease: Experience from an Eastern Indian Tertiary Center

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ABSTRACT

Background: Parkinson's disease (PD) is defined by motor signs, but non-motor symptoms (NMS) – neuropsychiatric, autonomic, sleep, sensory, and cognitive – often arise early, drive disability, and reduce health-related quality of life (HRQoL). Regional NMS profiles can inform screening and management.

Methods: We conducted a cross-sectional study at a tertiary hospital in Eastern India. Consecutive adults with idiopathic PD (Hoehn & Yahr stages 1–4) underwent structured assessment using validated instruments: NMS questionnaire, NMS scale (NMSS), Montreal Cognitive Assessment (MoCA), Beck Depression Inventory (BDI-II), Beck Anxiety Inventory, Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI), PD Questionnaire-39 (PDQ-39), Visual Analog Scale for pain, and King's PD pain scale. Demographic and clinical data were recorded. Descriptive statistics summarized prevalence and severity; comparative analyses explored associations between NMS burden and patient characteristics.

Results: A total of 150 patients (mean age ~63 years; male ≈ two-thirds; disease duration ~7 years) were included. The NMS burden was high: Depression affected approximately half, insomnia about one-third, and cognitive impairment around two-fifths. Constipation and orthostatic hypotension were frequent autonomic problems, whereas olfactory dysfunction and pain were also common. Mean PSQI scores reflected poor sleep quality. Higher NMS burden correlated with worse HRQoL.

Conclusion: NMS are ubiquitous in this Eastern Indian PD cohort and substantially impact HRQoL. Routine, structured NMS screening alongside motor evaluation should be the standard of care. Region-aware, multidisciplinary strategies addressing mood, sleep, cognition, autonomic dysfunction, and pain are essential.

Keywords: Sleep disturbances, Hyposmia, Nonmotor burden, Parkinson's disease

INTRODUCTION

Non-motor symptoms (NMS) are integral to Parkinson's disease (PD) and often precede or parallel motor manifestations.[1-4] Beyond the classic triad of tremor, rigidity, and bradykinesia, patients frequently describe prodromal or early-stage complaints that foreshadow the motor syndrome, and these symptoms may fluctuate with disease progression and treatment state.[1-4] NMS span several interrelated domains and rarely occur in isolation; instead, they tend to cluster as recognizable constellations that evolve over time, complicating both diagnosis and longitudinal management.[1-4] They include neuropsychiatric symptoms (depression, anxiety, and apathy), sleep disorders (insomnia, REM sleep behavior disorder [RBD], and excessive daytime sleepiness [EDS]), autonomic dysfunction (constipation, orthostatic hypotension, and urinary symptoms), sensory disturbances (pain and hyposmia/phantosmia), and cognitive impairment.[1,5-9] Within these domains, individual manifestations show variable trajectories – such as anxiety and sleep disruption worsening with stressors or motor fluctuations, or constipation and hyposmia remaining relatively persistent – underscoring the need for proactive screening at each visit.[1,5-9]

The cumulative NMS burden is a major determinant of health-related quality of life (HRQoL) and caregiver strain and is frequently under-recognized in routine care.[6-8,10] Even when motor symptoms are comparatively well controlled, untreated depression, anxiety, insomnia,

pain, or autonomic dysfunction can drive disability, hospitalizations, and care-partner exhaustion.[6-8,10] Under-recognition arises from limited consultation time, patient reluctance to volunteer "non-neurological" complaints, and the diffuse ownership of symptoms across specialties (neurology, psychiatry, sleep medicine, gastro-urology, and pain services).[6–8,10] Systematic, domain-based enquiry mitigates these gaps by normalizing discussion of sensitive symptoms and by linking each complaint to specific therapeutic options.[6-8,10]

Accordingly, multidomain assessment frameworks have been proposed to capture both motor and non-motor dimensions and to guide treatment prioritization.[10] These structured approaches emphasize rapid screening followed by severity grading, enabling teams to triage high-impact problems (e.g., major depression, RBD with injury risk, orthostatic hypotension with falls, and refractory pain) before addressing lower-burden issues.[10] Such frameworks align with personalized care: They help map symptom clusters, relate them to dopaminergic states, and prompt targeted non-pharmacologic and pharmacologic interventions, including when to escalate to multidisciplinary input.[10]

Importantly, the expression and salience of NMS are not uniform across settings. Given potential variations across populations due to demographic, cultural, and health-system factors – such as age at presentation, literacy, stigma around psychiatric complaints, diet and bowel habits, ambient sleep conditions, access to subspecialty clinics, and reimbursement models – region-specific NMS profiling is clinically valuable.[5,11] Regional data clarify which domains dominate local disability, reveal care-seeking bottlenecks (e.g., late referral for cognitive or autonomic symptoms), and inform training priorities for clinicians and allied health professionals.[5,11] Such information also supports resource planning by highlighting where brief screening tools and streamlined referral pathways can most improve HRQoL.[5,11]

Against this backdrop, we report the NMS profile of an Eastern Indian tertiary-care PD cohort, quantify domain-specific prevalence and severity, and examine relationships with HRQoL. Our objectives are fourfold: (i) To delineate the distribution of NMS across neuropsychiatric, sleep, autonomic, sensory, and cognitive domains; (ii) to estimate overall burden and identify high-impact clusters within this population; (iii) to evaluate associations between NMS burden and HRQoL metrics; and (iv) to highlight domains amenable to near-term practice changes through structured screening, targeted therapy, and multidisciplinary care pathways.[1-4,6-8,10,11]

MATERIALS AND METHODS

We performed a cross-sectional study at a tertiary-care teaching hospital in Eastern India from January 2023 to December 2023. Institutional approval and informed consent were obtained.

Adults with idiopathic PD fulfilling UK PDS Brain Bank/MDS criteria (Hoehn & Yahr stages 1–4) were enrolled. Exclusions: Atypical Parkinsonism, major non-PD neurological disease, or severe dementia precluding reliable assessment.

NMS screening/severity: NMS questionnaire (NMSQ) (presence) and NMS scale (NMSS) (domain severity: cardiovascular, sleep/fatigue, mood/apathy, perceptual problems, attention/memory, gastrointestinal, urinary, sexual, and miscellaneous).[1,9-11] Cognition and mood: Montreal Cognitive Assessment (MoCA); Beck Depression Inventory (BDI)-II and Beck Anxiety Inventory (BAI) for depression/anxiety.[7-9,19] Sleep: Epworth Sleepiness Scale (ESS) and PSQI; RBD features captured clinically/with directed questions; King's PD pain scale (KPPS) pain subitems recorded for nocturnal/musculoskeletal components.[4,13-16] Pain: VAS and KPPS total and domain scores.[17,18] Quality of life: PDQ-39 summary index and domain scores [Appendix 1].[5,12]

Demographics (age, sex, and education), clinical variables (age at onset, disease duration, H&Y stage, and levodopa equivalent daily dose), and instrument scores were recorded. Primary outcomes were prevalence of key NMS domains; secondary outcomes included mean PSQI and associations between NMS burden (NMSS total) and HRQoL (PDQ-39 SI) [Appendix 2].

Continuous variables are mean ± SD; categorical variables are *n* (%). Group comparisons used t-tests/analysis of variance or Mann–Whitney/Kruskal–Wallis as appropriate; χ^2 for categorical variables. Correlations used Pearson/Spearman. Two-sided $P < 0.05$ was significant (planned multivariable modeling explored predictors of high NMS burden).

RESULTS

A total of 150 patients were analyzed (mean age 62.5 ± 9.8 years; 66–68% men; mean disease duration 7.3 ± 4.1 years; mean H&Y 2.5 ± 0.8). Table 1 summarizes baseline characteristics.

The overall NMS burden was high across domains. Approximate prevalence estimates observed in this cohort are summarized in Table 2: Depression affected about half of patients; insomnia, about one-third; cognitive impairment, ~40%; constipation, nearly half; orthostatic hypotension, about one-third; olfactory dysfunction, about two-thirds; and pain in roughly half. These patterns echo prior literature showing high NMS frequency in PD.[1-3,5-9]

Mean PSQI was 6.7±1.5, indicating poor sleep quality at the group level. Sleep disturbances (insomnia, EDS) and mood symptoms were frequent and clinically relevant. Table 3 summarizes available summary measures.

Table 1: Baseline demographics and clinical profile (*n*=150)

Characteristic	Value
Age, years	62.5±9.8
Male sex, *n* (%)	≈100 (≈67%)
Disease duration, years	7.3±4.1
Hoehn & Yahr stage (mean)	2.5±0.8
Levodopa equivalent daily dose	-

Table 2: Key non-motor symptoms: Observed prevalence

Symptom/domain	Prevalence (%)
Depression (BDI-based)	54.3
Insomnia (clinical/PSQI-linked)	32.9
Cognitive impairment (MoCA-based)	40.0
Constipation (Rome-IV/Cleveland score)	45.0
Orthostatic hypotension	30.0
Olfactory dysfunction	65.0
Any chronic pain (KPPS/VAS)	≈50.0

BDI: Beck Depression Inventory, PSQI: Pittsburgh Sleep Quality Index, KPPS: King's Parkinson's disease pain scale, VAS: Visual Analog Scale, MoCA: Montreal Cognitive Assessment

Table 3: Sleep and mood summary metrics

Measure	Mean±SD
PSQI (global score)	6.7±1.51
Insomnia (present)	32.9%
Depression (present)	54.3%
Anxiety (present)	-
ESS (daytime sleepiness)	-

PSQI: Pittsburgh Sleep Quality Index, ESS: Epworth Sleepiness Scale

Higher NMSS totals and presence of mood/sleep issues were associated with worse PDQ-39 indices, consistent with prior evidence that NMS burden tracks HRQoL decrement.[5,12,19]

DISCUSSION

This tertiary-care cohort demonstrates a substantial burden of NMS across neuropsychiatric, sleep, autonomic, sensory, and cognitive domains. The prominence of depression (~54%), insomnia (~33%), cognitive impairment (~40%), constipation (~45%), orthostatic hypotension (~30%), hyposmia (~65%), and chronic pain (~50%) mirrors global reports that NMS are pervasive and often more disabling than motor features.[1-9,14-19,21,22] In line with international observations, the pattern suggests that multiple domains frequently co-occur within the same individual, amplifying disability through cumulative and interactive effects rather than via any single symptom alone.[1-9,14-19,21,22] Notably, the high rates of hyposmia and sleep disturbance are consistent with prodromal or early-stage involvement, while the substantial prevalence of mood symptoms and pain underscores the day-to-day burden that patients and caregivers prioritize during routine visits.[14-19,21,22] Taken together, these findings reinforce the contemporary understanding that comprehensive PD care must extend beyond motor status to include systematic, repeated surveillance of non-motor domains.[14-19,21,22]

Sleep disturbances (quantified by PSQI) and mood symptoms correlated with poorer HRQoL, supporting routine screening and integrated management.[5,12,14-16,19] The association likely reflects both direct effects on well-being (e.g., insomnia-related fatigue, anhedonia, and anxiety-driven avoidance) and indirect effects mediated by activity restriction, falls risk, and caregiver strain.[12,14,15,16,19] Within HRQoL instruments, decrements typically localize not only to mood and cognition subscales but also to mobility, activities of daily living, and bodily discomfort, suggesting that non-motor disturbances reverberate across broader functional domains.[5,12,14-16,19] Importantly, these relationships were evident even in a routine clinical setting, emphasizing that structured non-motor assessment can yield actionable targets without the need for specialized research infrastructure.[15,16,19]

Our findings align with longitudinal and multicenter studies that highlight: (i) Early appearance of NMS, including sleep and olfactory deficits; (ii) partial independence of NMS trajectories from motor progression; and (iii) the clinical value of clustering patients by combined motor-non-motor profiles to tailor care.[2,3,5,9,10,22] A cluster-informed approach helps identify subgroups – such as those dominated by neuropsychiatric-sleep burden versus those with autonomic-pain predominance – thereby guiding prioritization of counseling, non-pharmacological strategies, and selective pharmacotherapy.[2,5,9–11,22] It also facilitates anticipatory guidance (e.g., monitoring orthostatic symptoms in those with early autonomic involvement) and more rational sequencing of therapies when treatment side-effects may differentially worsen specific NMS.[2,3,5,9,22]

In routine practice, embedding the NMSQ/NMSS, MoCA, PSQI/ESS, BDI-II/BAI, KPPS, and PDQ-39 into PD reviews can uncover treatable problems. A brief, two-step workflow – screen broadly, then grade severity within positives – can be integrated into standard appointments without substantially extending visit length.[23-25] Priority domains for targeted intervention in our setting include depression/anxiety (psychological therapies and antidepressants with favorable PD profiles), insomnia/EDS (sleep hygiene, CBT-I, medication review, and selective pharmacotherapy), constipation and orthostatic hypotension (non-pharmacological measures plus targeted drugs), pain (optimize dopaminergic therapy, physical therapy, and neuropathic agents where appropriate), and cognitive concerns (cognitive training and cholinesterase inhibitors where indicated).[14-18,20,21]

Embedding multidisciplinary referral pathways (neurology, psychiatry, sleep, autonomic, rehabilitation, and pain services) can streamline care and reduce fragmentation.

Strengths include the use of validated instruments across multiple domains and the systematic capture of HRQoL. Limitations include cross-sectional design, single-center setting, and incomplete availability of some scale-level details (e.g., ESS, anxiety percentages). The study was not powered for detailed multivariable modeling of individual NMS predictors; these exploratory analyses should be expanded in future work. Prospective, multicenter, adequately powered studies – ideally incorporating longitudinal clustering and targeted intervention trials – are warranted to test whether structured NMS pathways translate into sustained HRQoL gains in comparable regional populations.

CONCLUSION

NMS are ubiquitous and clinically consequential in PD. In this Eastern Indian cohort, mood and sleep disturbances, autonomic dysfunction, pain, hyposmia, and cognitive impairment were common and collectively associated with worse HRQoL. Routine NMS screening and multidisciplinary, region-aware management should be standard alongside motor care.

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APPENDIX

Appendix 1. Operational definitions and scales used (abridged)

- NMSQ/NMSS: NMS presence and domain-wise severity scoring across nine domains.
- MoCA: Global cognition; impairment typically <26/30.
- BDI-II/BAI: Depression/anxiety symptom severity scales.
- PSQI/ESS: Sleep quality (past month) and daytime sleepiness.
- KPPS/VAS pain: Pain phenotype quantification in PD.
- PDQ-39: HRQoL index and eight domain scores.

Appendix 2. Data capture proforma (abridged)

- Demographics; PD history (onset age and duration); meds (LEDD).
- H&Y stage; motor phenotype; comorbidities.
- NMSQ/NMSS domains; MoCA; BDI-II/BAI; PSQI/ESS; KPPS; PDQ-39.