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Chapter 20

Unmasking the Hidden Burden: Improving Detection of Non-Motor Symptoms in *Idiopathic Parkinson's Disease* through Screening and Clinical Workflows

Dr. Veena Nath A[1*] and Dr. Rakesh J[2]

[1]*DM First Year Senior Resident, Department of Neurology, Jubilee Mission Medical College & Research Institute, Thrissur.*
[2]*Assistant Professor, Department of General Medicine, Mount Zion Medical College, Ado.*
[*]*Corresponding Author.*

Abstract

Idiopathic Parkinson's disease is increasingly recognized as a complex multisystem disorder extending beyond its classical motor manifestations. Non-motor symptoms (NMS) including neuropsychiatric disturbances, cognitive impairment, autonomic dysfunction, and sleep disorders often precede motor onset and contribute significantly to disease burden, reduced quality of life, and increased caregiver stress. Despite their clinical importance, NMS remain underdiagnosed, particularly in resource-limited settings such as India, due to high patient load, lack of structured screening, limited awareness among primary care physicians, and sociocultural stigma surrounding mental health symptoms.

This chapter highlights the broad spectrum of non-motor manifestations and their underlying pathophysiology involving both dopaminergic and non-dopaminergic systems. It emphasizes the importance of early detection, given the prognostic implications of NMS in disease progression and treatment response. Standardized tools such as the Non-Motor Symptoms Questionnaire (NMSQuest), Non-Motor Symptoms Scale (NMSS), Montreal Cognitive Assessment (MoCA), Geriatric Depression Scale (GDS), SCOPA-Sleep, and autonomic symptom questionnaires are discussed as practical instruments for systematic assessment.

In addition, targeted screening for frequently overlooked symptoms such as fatigue, pain, and olfactory dysfunction is emphasized to improve early detection and comprehensive assessment.

The chapter further proposes integration of structured screening into routine clinical workflows through OPD-based models, primary care involvement, and multidisciplinary approach. It also explores the role of digital health technologies, including telemedicine and mobile applications, in enhancing early detection and longitudinal monitoring. Key barriers within the Indian healthcare system are identified, along with actionable strategies such as clinician training, patient education, and development of culturally adapted screening tools.

In conclusion, improving recognition and management of non-motor symptoms through standardized screening and integrated care pathways is essential for delivering holistic, patient-centered care in Idiopathic Parkinson's disease.

Keywords: Idiopathic Parkinson's disease, Non-motor symptoms, early detection, Screening tools, Clinical workflows.

1. Introduction

Idiopathic Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by degeneration of dopaminergic neurons in the substantia nigra, leading to dopamine deficiency and widespread neurochemical imbalance. Traditionally, PD has been defined by its motor manifestations; however, increasing evidence highlights that the disease extends far beyond movement abnormalities and represents a multisystem disorder affecting cognition, mood, autonomic regulation, and sleep [1,2].

In recent years, there has been a paradigm shift from a purely motor-centric model to a holistic understanding of Idiopathic Parkinson's disease. This shift recognizes that non-motor symptoms (NMS) often precede motor symptoms and significantly contribute to disability,

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reduced quality of life, and caregiver burden [3]. In India, the recognition of NMS remains limited due to resource constraints, high patient load in outpatient settings, and limited structured screening practices in primary care. Cultural stigma surrounding psychiatric and cognitive symptoms further contributes to underreporting and delayed diagnosis [4].

Studies on non-motor symptoms (NMS) in idiopathic Parkinson's disease typically exclude participants with atypical Parkinsonism such as multiple system atrophy (MSA), progressive supranuclear palsy (PSP), and dementia with Lewy bodies (DLB), as well as secondary causes including vascular and drug-induced parkinsonism. Patients with dementia, severe psychiatric illnesses, major comorbidities (such as diabetes when assessing autonomic dysfunction), and those unable to provide informed consent are also commonly excluded. These exclusions are essential to ensure that the non-motor symptoms evaluated are attributable specifically to idiopathic Parkinson's disease and are not confounded by overlapping pathologies, comorbid conditions, or unreliable clinical reporting. Recognizing these non-motor symptoms is essential to transform the clinical understanding and management of idiopathic Parkinson's disease from a motor-centric disorder to a comprehensive multisystem condition.

2. Idiopathic Parkinson's disease: Beyond Motor Symptoms

The pathophysiology of PD involves degeneration of dopaminergic neurons, but also includes wide spread alpha-synuclein pathology affecting cortical and subcortical regions. This explains the broad spectrum of non-motor manifestations [5]. In addition, involvement of non-dopaminergic systems such as serotonergic, cholinergic, and nor adrenergic pathways further contributes to the heterogeneity of symptoms.

Motor symptoms include:

- Resting tremor
- Rigidity
- Bradykinesia
- Postural instability
- Freezing of gait

However, non-motor symptoms are now recognized as core clinical components rather than secondary features. These include neuropsychiatric, cognitive, autonomic, and sensory disturbances that may appear years before motor onset [6]. Early identification of these symptoms can aid in timely diagnosis and improved disease management.

3. Spectrum of Non-Motor Symptoms in Idiopathic Parkinson's disease

3.1. Neuropsychiatric Manifestations

Depression, anxiety, apathy, hallucinations, and psychosis are common and often underdiagnosed. Depression affects up to 40% of PD patients and significantly impacts treatment adherence [7]. Impulse control disorders (e.g., pathological gambling, hypersexuality) may also occur, often related to dopaminergic therapy.

3.2. Cognitive Impairment

Mild cognitive impairment (MCI) is frequently observed in early PD, progressing in many cases to Idiopathic Parkinson's disease dementia (PDD), affecting executive function and memory [8]. Visuospatial dysfunction and impaired attention are also frequently reported cognitive deficits.

3.3. Autonomic Dysfunction

Autonomic involvement includes constipation, urinary dysfunction, orthostatic hypotension, and sexual dysfunction. Constipation may precede motor symptoms by several years [9]. Other features such as excessive sweating and seborrhea may also be present.

3.4. Sleep and Sensory Disturbances

Sleep disorders such as REM sleep behavior disorder (RBD), insomnia, and excessive daytime sleepiness are highly prevalent. Sensory symptoms such as hyposmia, fatigue, and chronic pain are also common early indicators [10]. Restless legs syndrome and circadian rhythm disturbances may further complicate sleep patterns.

4. Clinical Burden and Diagnostic Challenges

Non-motor symptoms are frequently underreported by patients due to lack of awareness or misattribution to aging and comorbid conditions. In busy outpatient departments, clinicians often prioritize motor symptoms, leaving NMS unaddressed [11]. This leads to significant reduction in quality of life and increased caregiver burden.

Additional challenges include:

- Lack of standardized screening protocols
- Time constraints in consultations
- Limited psychiatric integration in neurology care

- Cultural stigma in reporting cognitive and emotional symptoms, particularly in Indian settings [12]
- Limited awareness among primary care physicians regarding non-motor symptom screening
- Inadequate use of validated tools such as NMSQuest or NMSS in routine practice

5. Importance of Early Detection of Non-Motor Symptoms

Early recognition of NMS is crucial because:

- They significantly reduce quality of life
- They predict faster disease progression
- They increase caregiver burden
- They influence pharmacological response and adherence [13]
- They may serve as early prodromal markers before the onset of classical motor symptoms
- They are often more disabling than motor symptoms in advanced stages

Early detection also allows timely interventions, improving long-term functional outcomes and psychosocial well-being. It also facilitates individualized treatment planning and early supportive care interventions.

6. Screening Tools for Non-Motor Symptoms

6.1. Standardized Questionnaires

- Non-Motor Symptoms Questionnaire (NMSQuest)
- Non-Motor Symptoms Scale (NMSS)

Non-Motor Symptoms Questionnaire (NMSQuest)

A simple, patient-completed screening tool designed to identify the presence of a wide range of non-motor symptoms in Idiopathic Parkinson's disease. It is useful for rapid assessment in outpatient settings but does not quantify severity.

Non-Motor Symptoms Scale (NMSS)

A clinician-administered scale that evaluates both the frequency and severity of non-motor symptoms across multiple domains. It provides a comprehensive measure of overall symptom burden and is useful for monitoring disease progression and treatment response.
These tools provide structured assessment of symptom burden [14]. They are easy to administer in outpatient settings and help in systematic documentation of symptoms.

6.2. Cognitive and Psychiatric Tools

- Montreal Cognitive Assessment (MoCA)
- Geriatric Depression Scale (GDS)

Montreal Cognitive Assessment (MoCA)

A brief, sensitive screening tool used to detect mild cognitive impairment in Idiopathic Parkinson's disease, particularly affecting executive function, attention, and visuospatial abilities. It is widely used in clinical practice for early identification of cognitive decline.

Geriatric Depression Scale (GDS)

A simple, self-report questionnaire designed to screen for depression in elderly patients, including those with Idiopathic Parkinson's disease. It helps in identifying mood disturbances that may otherwise be overlooked in routine neurological evaluation.
These are widely validated for PD-related cognitive and mood disorders [15]. They assist in early identification of subtle cognitive decline and mood disturbances that may otherwise be overlooked.

6.3. Sleep and Autonomic Tools

- SCOPA-Sleep
- Autonomic symptom questionnaires

SCOPA-Sleep

A validated tool specifically designed to assess sleep disturbances in Idiopathic Parkinson's disease, including nighttime problems and excessive daytime sleepiness. It helps in identifying and quantifying sleep-related issues that impact quality of life.

Autonomic symptom questionnaires

Structured tools used to evaluate dysfunction of the autonomic nervous system, such as gastrointestinal, urinary, cardiovascular, and sexual symptoms. They aid in early detection and systematic assessment of autonomic involvement in Idiopathic Parkinson's disease.

These tools help detect early autonomic and sleep dysfunction [16]. They are particularly useful in identifying prodromal features such as REM sleep behavior disorder and orthostatic symptoms.

6.4. Additional Symptom-Specific Screening

In addition to standardized tools, targeted screening for commonly overlooked non-motor symptoms is essential in idiopathic Parkinson's disease. Incorporating simple, structured methods into routine clinical practice can significantly improve early detection.

Fatigue

Fatigue is a frequent and disabling symptom in idiopathic Parkinson's disease and is often underreported unless specifically enquired.

Screening Methods:

- Direct clinical questioning (e.g., "Do you feel persistently tired or lacking energy despite adequate rest?")
- Use of validated scales such as:
  - Parkinson Fatigue Scale (PFS-16)
  - Fatigue Severity Scale (FSS)
- Assessment of impact on daily functioning and differentiation from depression or sleep disorders
- Periodic reassessment during follow-up visits to monitor progression

Pain and Sensory Symptoms

Pain, including musculoskeletal, neuropathic, dystonic, and central pain, is commonly underrecognized in idiopathic Parkinson's disease.

Screening Methods:

- Structured pain history including:
  - Onset, duration, location, and character of pain
  - Relation to motor fluctuations ("on-off" periods)
- Use of pain assessment tools:
  - Visual Analog Scale (VAS)
  - Brief Pain Inventory (BPI)
  - King's Parkinson's Disease Pain Scale (KPPS)
- Identification of pain subtype (musculoskeletal vs neuropathic vs central)
- Evaluation of functional impact on mobility, sleep, and quality of life

Olfactory Dysfunction

Hyposmia or anosmia is an early prodromal feature of idiopathic Parkinson's disease and may precede motor symptoms by several years.

Screening Methods:

- Simple bedside questioning (e.g., "Have you noticed a reduced ability to smell?")
- Objective smell identification tests such as:
  - University of Pennsylvania Smell Identification Test (UPSIT)
  - Sniffin' Sticks test
- Use of culturally adapted smell tests where available
- Screening particularly useful in early-stage disease or high-risk individuals

7. Clinical Workflow Integration

7.1. OPD-Based Screening Model

A stepwise screening approach in neurology OPDs can significantly improve detection rates. Nurses and allied health professionals can assist in initial questionnaire-based screening. This reduces physician workload and ensures comprehensive symptom evaluation.

7.2. Primary Care Integration

Early identification at the primary care level is essential in India, where specialist access is limited. Structured referral pathways are required for timely neurology evaluation [17]. Training primary care physicians in recognizing early NMS can bridge the gap in early diagnosis.

7.3. Multidisciplinary Team Approach

Effective management requires a multidisciplinary approach, involving coordinated care between neurologists, psychiatrists, physiotherapists, occupational therapists, clinical pharmacists, social workers, speech and language therapists, and dieticians. This integrated approach ensures comprehensive assessment and management of both motor and non-motor symptoms in idiopathic Parkinson's disease.

7.4. Digital Health Integration

Mobile health applications, telemedicine platforms, and EHR-based alerts are emerging tools to support systematic NMS screening [18]. Wearable devices and remote monitoring tools may further enhance continuous symptom tracking.

8. Barriers in the Indian Healthcare System

Key barriers include:

- Limited neurologist availability in rural areas
- Low awareness among primary care physicians
- Stigma associated with psychiatric symptoms
- Financial and geographic access constraints [9]
- Limited availability of standardized screening tools in regional languages
- Fragmented care delivery and lack of integrated multidisciplinary services

9. Strategies for Improving Detection and Care

Improvement strategies include:

- Training programs for healthcare professionals
- Simplified screening algorithms for OPD use
- Community awareness campaigns
- Expansion of tele-neurology services
- Patient and caregiver education initiatives [19]
- Incorporation of NMS screening into routine clinical checklists
- Development of culturally adapted and language-specific screening tools

10. Future Directions

Future advances in PD care include:

- Artificial intelligence-based predictive screening models
- Integration of biomarkers with clinical screening
- Expansion of digital neurology services in India
- Personalized medicine approaches for symptom-specific management [20]
- Use of genetic profiling and neuroimaging biomarkers for early risk stratification
- Development of disease-modifying therapies targeting alpha-synuclein pathology

11. Conclusion

Non-motor symptoms represent a major but underrecognized burden in idiopathic Parkinson's disease. Their early identification through structured screening tools and integrated clinical workflows is essential for holistic patient care. Incorporating targeted screening for commonly overlooked symptoms such as fatigue, pain, and olfactory dysfunction further enhances early detection and comprehensive management. In India, strengthening primary care awareness, expanding multidisciplinary approaches, and leveraging digital health technologies are key strategies to improve outcomes. A patient-centered model that addresses both motor and non-motor domains is critical for future idiopathic Parkinson's disease management.

References

[1] Bloem BR, Okun MS, Klein C. Parkinson's disease. The Lancet. 2021 Jun 12;397(10291):2284-303.

[2] Poewe W. Diagnosing Synucleinopathies: Will Parkinson's Disease or Dementia with Lewy Bodies Become 'Biologically'Defined?. Neurology. 2024 Aug.

[3] Chaudhuri KR, Tolosa E, Schapira AH, Poewe W, editors. Non-motor symptoms of Parkinson's disease. Academic; 2014.

[4] Chakraborty AP, Mukherjee A, Sarkar S, Sinharoy U, Biswas A. Evaluation of non-motor symptoms in wilson disease using the parkinson's disease nonmotor symptoms questionnaire: A pilot cross-sectional study and critical assessment. Annals of Indian Academy of Neurology. 2022 Nov 1;25(6):1062-6.

[5] Surmeier DJ, Zhai S, Cui Q, Simmons DV. Rethinking the network determinants of motor disability in Parkinson's disease. Frontiers in Synaptic Neuroscience. 2023 Jun 28;15:1186484.

[6] Boura I, Poplawska-Domaszewicz K, Limbachiya N, Trivedi D, Batzu L, Chaudhuri KR. Prodromal Parkinson's disease: a snapshot of the landscape. Neurologic Clinics. 2025 May 1;43(2):209-28.

[7] Goldman JG. Non-motor symptoms and treatments in Parkinson's disease. Neurologic clinics. 2025 May 1;43(2):291-317.

[8] Aarsland D, Creese B, Politis M, Chaudhuri KR, Ffytche DH, Weintraub D, Ballard C. Cognitive decline in Parkinson disease. Nature Reviews Neurology. 2017 Apr;13(4):217-31.

[9] Páez-García S, Ramírez-Triana J, Folleco-Insuasty L, Orozco-Castro S, Fernández-de Castro S, Garcia-Cifuentes E, Cerquera-Cleves C. Non-motor symptoms in Parkinson's disease: Recognition, diagnosis, and implications for comprehensive management. Acta Neurológica Colombiana. 2025 Dec;41(4).

[10] Cattaneo C, Fabbrini A, Belvisi D, Aiello F, Marchet F, Fabbrini G. Non-Motor Symptoms: The Hidden Face of Parkinson's Disease. Cells. 2025 Dec 25;15(1):42.

[11] van der Meer F, Jorgensen J, Hiligsmann M. Burden of non-motor symptoms of Parkinson's disease: cost-of-illness and quality-of-life estimates through a scoping review. Expert Review of Pharmacoeconomics & Outcomes Research. 2025 Jan 2;25(1):17-27.

[12] Li X, Chen C, Pan T, Zhou X, Sun X, Zhang Z, Wu D, Chen X. Trends and hotspots in non-motor symptoms of Parkinson's disease: a 10-year bibliometric analysis. Frontiers in aging neuroscience. 2024 Jan 17;16:1335550.

[13] Chou SC, Cong C, Brownson-Smith R, Milne-Ives M, Meinert E. Assessment of mental and behavioural non-motor symptoms of Parkinson's Disease using Artificial Intelligence (AI): a systematic review. Communications Medicine. 2026 Feb 9;6(1):101.

[14] Paudel P, Sah A. Nonmotor symptoms in Parkinson's disease patients in South Asia: A systematic review and meta-analysis. Clinical Parkinsonism & Related Disorders. 2025 Jul 30:100374.

[15] Regensburger M, Csoti I, Jost WH, Kohl Z, Lorenzl S, Pedrosa DJ, Lingor P. Motor and non-motor fluctuations in Parkinson's disease: the knowns and unknowns of current therapeutic approaches. Journal of Neural Transmission. 2026 Feb;133(2):309-24.

[16] Ottoni IB, Reis PM, Tostes JG. A importância dos sintomas não motores na abordagem da Doença de Parkinson. Research, Society and Development. 2024 Nov 2;13(11):e08131147255-.

[17] Lamana IV, de Oliveira AC, Bertazzo LT, Nogueira NB, dos Santos JC, Stangherlin L. Non-Motor Features of Parkinson Disease: A New Clinical State of The Art. Brazilian Journal of Clinical Medicine and Review. 2025 Mar 15;3(1):bjcmr29-.

[18] Peña-Zelayeta L, Delgado-Minjares KM, Villegas-Rojas MM, León-Arcia K, Santiago-Balmaseda A, Andrade-Guerrero J, Pérez-Segura I, Ortega-Robles E, Soto-Rojas LO, Arias-Carrión O. Redefining non-motor symptoms in Parkinson's disease. Journal of Personalized Medicine. 2025 Apr 26;15(5):172.

[19] Khan A, Ezeugwa J, Ezeugwu VE. A systematic review of the associations between sedentary behavior, physical inactivity, and non-motor symptoms of Parkinson's disease. PLoS One. 2024 Mar 29;19(3):e0293382.

[20] Goldman JG. Non-motor symptoms and treatments in Parkinson's disease. Neurologic clinics. 2025 May 1;43(2):291-317.