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Original Research Article

Prevalence and Clinical Characteristics of Parkinson's Disease in Sub-Saharan Africa: A Hospital-based Study-Cameroon

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Abstract: ***Introduction*:** The Sub-Saharan African population is experiencing an increase in neurodegenerative diseases (ND). Parkinson's disease (PD) is one of the major ND encountered due to a steady increase in life expectancy. We aimed to determine the prevalence, describe the clinical characteristics, and the most common comorbidities of patients with PD. ***Methods*:** A descriptive cross-sectional study was carried out at the neurology outpatient department of the Yaoundé Central Hospital (YCH). Sociodemographic, clinical data and paraclinical data were obtained after informed consent. Moreover, the UK Parkinson's Disease Society Brain Bank Diagnostic Criteria (UKPDSB) was used for diagnosis, and the Movement Disorders Society Unified Parkinson's disease Rating Scale (MDS-UPDRS) was used to assess severity and disease progression. ***Results*:** Out of a total of 725 patients consulted at the YCH, PD accounted for a hospital-based prevalence of 4.27%. Bradykinesia and rest tremor were the most common presenting motor symptoms (96.77% each), followed by cogwheel rigidity (58.06%) and postural instability (22.58%). Non-motor symptoms were fatigue (64.52%), autonomic dysfunctions with cardiovascular disorders [orthostatic hypertension (64.52%)], gastrointestinal disorders [constipation (41.94%)], and urinary problems (38.71%). Hypertension was found to be the most common comorbidity in the study population (35,48%). ***Conclusion*:** The hospital prevalence of PD is not negligible and remains one of the most frequent ND in SSA.

Keywords: Prevalence, Parkinson's Disease, Neurodegenerative Disease, Sub-Saharan Africa.

INTRODUCTION

Parkinson's disease (PD) is a neurodegenerative disease (ND) due to early, prominent death of dopaminergic neurons in the substantia nigra pars compacta (SNpc)[1]. PD is the second most common ND worldwide [2], and predictions estimate that by 2050, most of the older population will live in less developed countries, with the older population having tripled, reaching nearly 2.1 billion, compared to 901 million in 2015 [3]. A 2024 systematic review of 83 studies found a global all-age prevalence of about 1.8 per 1000 people [4]. Also, the Global Burden of Disease (GBD) study for 2021 reports an age-standardised prevalence of about 139 per 100,000 people, corresponding to about 11.8 million people worldwide [5–7]. Moreover, among adults >60 years, prevalence rises sharply to about 9.7 per 1000 people [4], and peaks in the 80-89-year age range, with higher prevalence in males (M/F=1.3-1.5) [8, 9]. Furthermore, the estimates of age-sex-adjusted incidence of PD in North America range from 108 to 212 per 100,000 among persons ages 65 and older, and from 47 to 77 per 100,00 among persons ages 45 and older [10]. The highest pooled prevalence in the WHO European region is estimated at 1.8 per 1000 people, versus 0.87 per 1000 in Southeast Asia, with Western Pacific at 1.55 per 1000 [4].

In sub-Saharan Africa (SSA), the increasing life expectancy due to better health conditions also brings along the burden of age-related diseases such as PD [11]. The prevalence of Parkinsonism in SSA varied from 0.41% to 7.2% [11]. Also, early continent-wide reviews identified PD from at least 13 countries and found prevalence and incidence lower than in Western populations [12–14]. In sub-Saharan Africa (SSA), crude prevalence in community studies ranges 7-67 per 100,000 [14, 15]. Hospital-based proportions are

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estimated to be 0.4 to 0.7% of neurological admissions in multiple SSA countries [16]. Moreover, age at onset clusters in the late 60s with typical male predominance [17, 18].

The 3rd census of the Cameroonian population in 2010 reported that people aged 60 years and above constituted 5% of the whole population [19]. Studies carried out in Cameroon in the past have highlighted PD as the most common ND [20], and among the most common causes of movement disorders [21]. Diagnosing PD at early stages is important because treatment greatly reduces the risk of the disease progressing to its final stage, where the patient can suffer from disabilities[22]. With studies on PD being rare in our setting, it is to raise awareness on these diseases that we undertook this study.

METHODS

Study Design, Setting, and Period

We carried out a descriptive cross-sectional study in the Neurology-Physical Medicine unit of the Yaoundé Central Hospital. This unit is one of the units of this referral hospital, a second-category healthcare institution in Yaoundé, the capital city of Cameroon.

Sampling and Participants

We consecutively included patients diagnosed with PD using the UK Parkinson's Disease Society Brain Bank Clinical Diagnostic criteria. We did not include patients who did not respect these diagnostic criteria.

Study Procedure

We explored the consultation records of neurologists to identify patients diagnosed with PD, after which we contacted them, got their informed consent, and re-assessed them. We used a well-structured questionnaire to record all socio-demographic data and comorbidities. The UK Parkinson's Disease Society Brain Bank Diagnostic Criteria(UKPDSB) was used for diagnosis [23]. The Movement Disorders Society Unified Parkinson's disease Rating Scale(MDS-UPDRS) [24], which evaluated motor and non-motor symptoms, with the Hoen and Yahr Scale, was used to evaluate the clinical symptoms and disability of patients diagnosed with PD. The Unified Parkinson's Disease Rating Scale was created in 1987, then updated and enhanced in 2008 by specialists from the Movement Disorder Society (MDS) to include new tools for assessing non-motor symptoms of Parkinson's disease (MDS-UPDRS)[25]. Part 1 deals with the non-motor experience of everyday life, Part 2 deals with the motor aspects of everyday life experiences, Part 3 constitutes the motor examination, and Part 4 assesses the severity of motor complications like dyskinesia, motor fluctuations, and dystonia.

Study variables were classified into 3 groups: Socio-demographic, Clinical, and Paraclinical.

Statistical Analysis

The data was entered and analyzed using Epi Info 7.0. Qualitative variables were expressed as counts and percentages, and quantitative variables in means with standard deviations.

Ethical Considerations

The entire procedure was approved by the Institutional Committee on Ethics and Research (CIER) of *Université des Montagnes.* All endeavors were done in accordance with the principles of the Declaration of Helsinki.

RESULTS

During the study period, a total of 725 patients were consulted in the outpatient department of the Neurology unit, and 31 patients were diagnosed or followed up for Parkinson's disease. This corresponds to a hospital prevalence of 4.27%. The mean age of PD patients was 69.16 ± 6.88 years, with an age range between 57 and 85 years. Most PD patients were in the 70-80 years age group (42%), followed by the 60-70years age group (39%) (Table I). Males in our study predominated (61%) with a m/F sex ratio of 1.58.

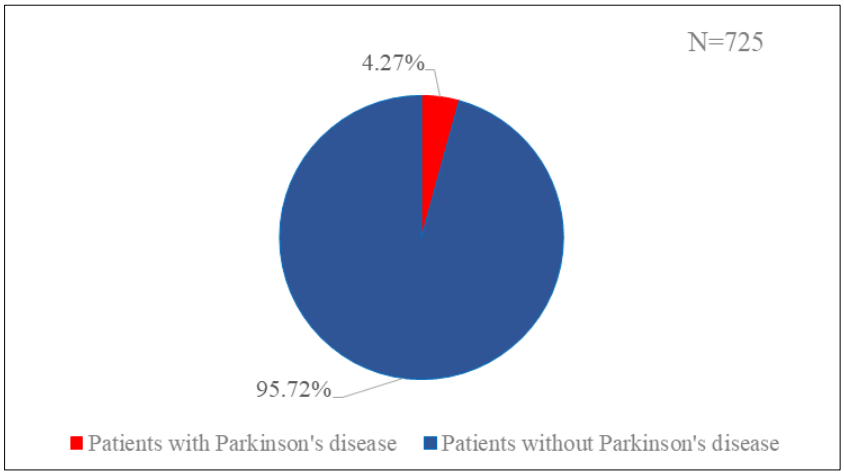

Figure 1: Prevalence of Parkinson's disease in our study population

Table I: Socio-demographic characteristics of patients with Parkinson's disease

Variable	Frequency (N=31)	Percentages (%)
Age		
[50-60]	4	12.90
[60-70]	12	38.71
[70-80]	13	41.94
[80-90]	2	6.45
Sex		
Male	19	61.29
Female	12	38.71

In our study population, the most common comorbidity found was hypertension (35.48%). Diabetes was low in the population (6.45%). No patient had HIV nor cancer (See Table II).

Table II: Comorbidities found in patients with Parkinson's disease

Variable	Frequency (N=31)	Percentages (%)
Hypertension		
Yes	11	35.48
No	20	64.52
Diabetes		
Yes	2	6.45
No	29	93.55
HIV		
Yes	0	0.00
No	31	100.00
Cancer		
Yes	0	0.00
No	31	100.00

Out of the 31 patients with PD, 30 patients had bradykinesia and rest tremor (96.77% each). 18 patients (58.06%) had cog wheel rigidity and 7 patients (22.58%) had non-ataxic postural instability (see Figure 2).

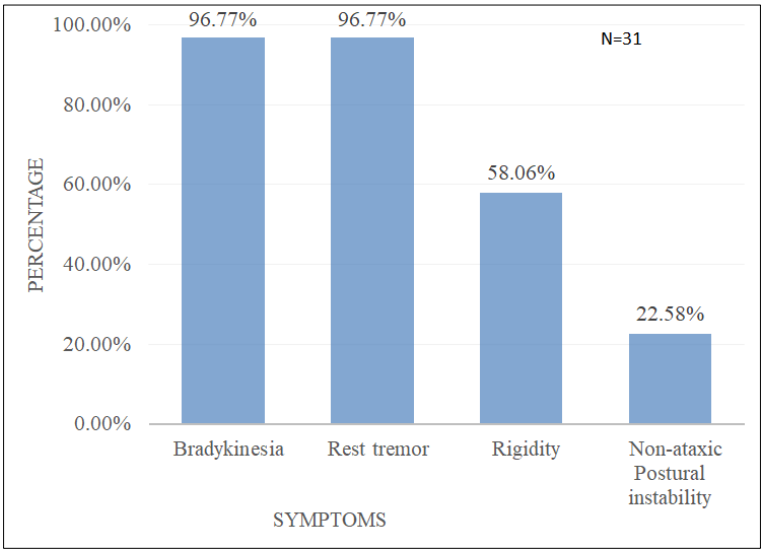

Figure 2: Main clinical symptoms of patients with PD in our study population

Table III: Main clinical symptoms of PD

Variable	Frequency(N=31)	Percentages (%)
Bradykinesia	30	96.77
Rest tremor	30	96.77
Rigidity	18	58.06
Postural instability	7	22.58

Among the 31 patients that were examined, most patients had no cognitive impairment (77.42%) nor depressed mood (77.42%) nor apathy (96.77%). Few patients had slight cognitive impairment (7 patients, 22.58%), slight hallucinations or psychosis (2 patients, 6.45%) and 1 patient with slight apathy (3.23%). 10 patients (32.26%) had slight to moderate sleep problems, 7 patients (25.81%) had slight to mild anxious mood, 7 patients (22.58%) had slight depression (see Figure 3).

Table IV: Neuropsychiatric disorders in patients with PD

Variable	Frequency(N=31)	Percentages (%)
Psychiatric disorders		
Apathy		
Slight	0	0
Mild	0	0
Moderate	0	0
Severe	1	3.23
Anxious mood		
Slight	0	0
Mild	0	0
Moderate	1	3.23
Severe	7	22.58
Depressed mood		
Slight	0	0
Mild	0	0
Moderate	0	0
Severe	7	22.58
Hallucinations		
Slight	0	0
Mild	0	0
Moderate	0	0
Severe	2	6.45
Cognitive impairment		
Slight	0	0
Mild	0	0
Moderate	0	0
Severe	7	22.58

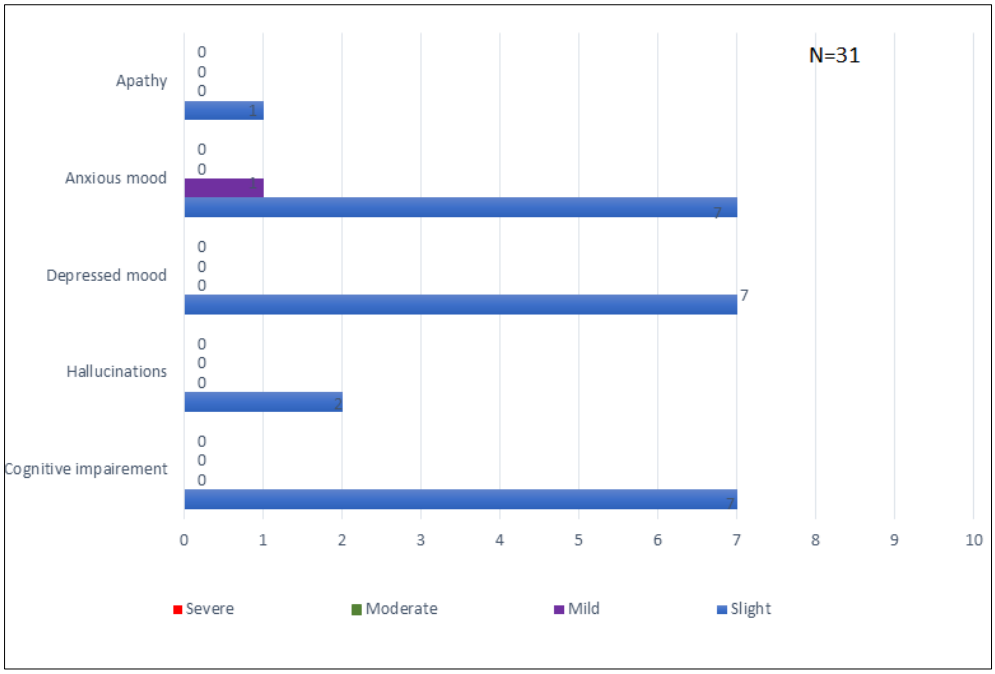

Figure 3: Psychiatric disorders in patients with Parkinson's disease

Autonomic dysfunctions in patients with PD the common symptoms by order of frequency were cardiovascular problems (in a total of 20 patients with slight to severe orthostatic hypotension (,64.52%), followed by gastrointestinal problems which included (with slight to moderate constipation problems in a total of 13patients, 41.94%) slight to moderate sialorrhea (10 patients, 32.26%) mild to moderate dysphagia (4 patients,13.3%) and finally urinary dysfunctions (slight to moderate urinary problems (12patients,38.71%)(see Figure 4).

Table V: Autonomic disorders in patients with PD

Variable	Frequency(N=31)	Percentages (%)
Autonomic disorders		
Orthostatic hypotension		
Slight	9	35.48
Mild	5	29.03
Moderate	5	16.13
Severe	1	3.23
Urinary problems		
Slight	9	29.03
Mild	2	6.45
Moderate	1	3.23
Severe	0	0
Dysphagia		
Slight	0	0
Mild	1	3.33
Moderate	3	10.00
Severe	0	0
Sialorrhea		
Slight	0	12.90
Mild	1	16.13
Moderate	5	3.23
Severe	4	0
Constipation		
Slight	0	6.45
Mild	3	25.81
Moderate	8	9.68
Severe	2	0

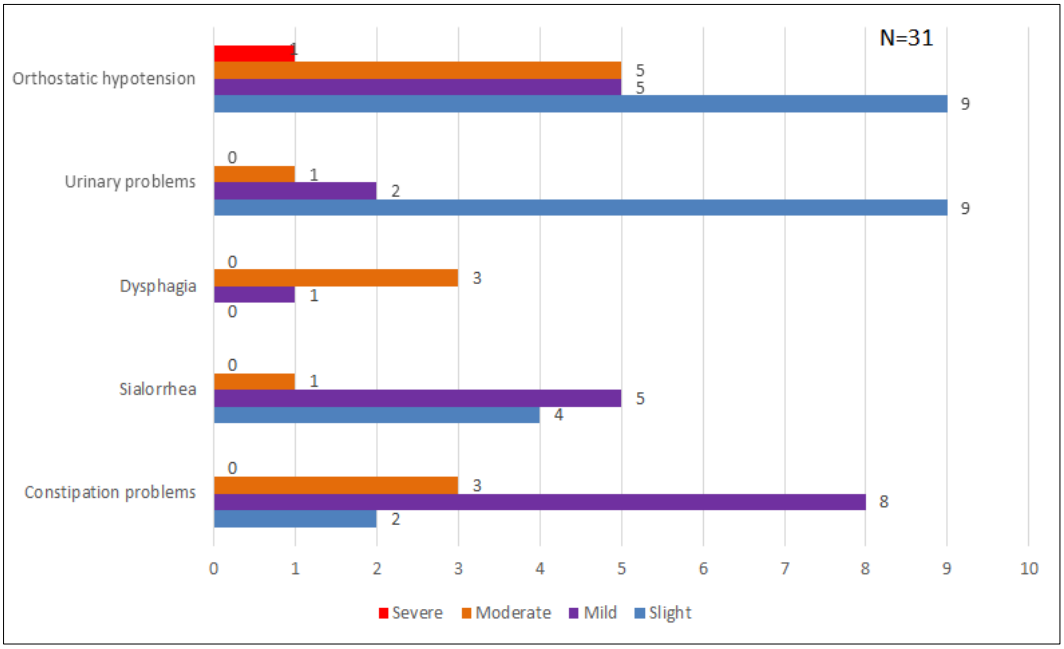

Figure 4: Autonomic dysfunctions in patients with Parkinson's disease

Sleep dysfunction in patients with PD

The sleep dysfunction including slight to moderate insomnia (10 patients, 32.26%) and daytime sleepiness (12 patients, 38.71%) was found. The most common other non-motor symptom was fatigue with 20 patients who had slight to moderate symptoms (48.39%) (See Figure 5).

Table VI: Sleep dysfunctions and other non-motor symptom in patients with PD

Variable	Frequency (N=31)	Percentages (%)
Fatigue		
Slight	15	48.39
Mild	3	9.68
Moderate	2	6.45
Severe	0	0
Daytime sleepiness		
Slight	7	22.58
Mild	4	12.90
Moderate	1	3.23
Severe	0	0
Insomnia		
Slight	3	9.68
Mild	4	12.90
Moderate	3	9.68
Severe	0	0

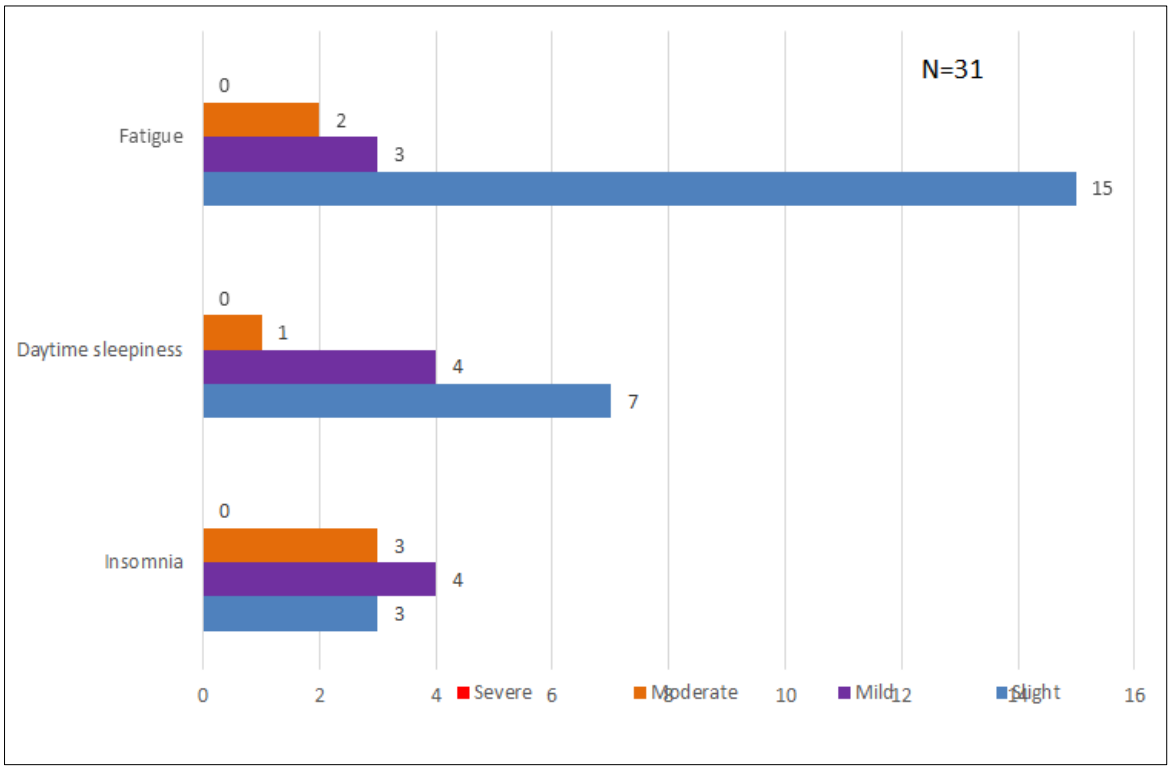

Figure 5: Sleep dysfunction and other non-motor symptoms in patients with Parkinson's disease

The MDS-UPDRS helps in the evaluation of the various aspects of PD including non-motor and motor experiences of daily living and motor complications. Also helps to monitor the severity and progression of the disease. The maximum total UPDRS score is 199 indicating the worst probable disability from PD.

The Hoen and Yahr scale was also used to stage the functional disability associated with PD

Table VII: MDS-UPDRS and Hoen-Yahr staging in patients with PD

Variable	Frequency(N=31)	Percentage (%)
MDS-UPDRS		
[20-60]	19	61
[60-100]	17	23
[100-140]	4	13
[140-180]	1	3
Hoen and Yahr Satge		
Stage 1	4	12.90
Stage 2	19	61.29
Stage 3	5	16.13
Stage 4	3	9.68

DISCUSSION

We conducted a hospital-based cross-sectional study at a sub-Saharan referral hospital to assess the epidemiological and clinical profile of Parkinson's disease.

The mean age of patients was 69±6.8 years, with the most represented age group between 60 and 80 years. This is similar to the results of Khalid *et al*., in 2008, in their study carried out in Sudan, showing a majority of the 70-80-year age group [26], Ayele *et al.,* in a multicenter study in Ethiopia in 2021, revealed a mean age of 62.9 years [27], and a 2018 review indicates a mean age of 69.4 years in Sub-Saharan Africa [28]. Also, studies carried out in Europe and North America reveal mean ages of early to mid-60s, often 65–70 years [29]. Moreover, Late-onset Parkinson's disease (LOPD) usually appears after age 60 and is tightly linked to brain aging. Accelerated or "exaggerated" aging is considered the primary risk factor for LOPD. Comparative modeling shows that age-related changes in energy metabolism, neuronal apoptosis, neuroinflammation, ion homeostasis, and immune dysfunction form the critical bridge between normal aging and LOPD. Substantia nigra neurons already lose about a quarter of their number in normal aging; PD brains lose ~70% compared with older controls, showing how aging primes this region for degeneration [30–32].

The M/F sex ratio was 1.58: 1 implying a male predominance. Large epidemiologic studies and meta-analyses show men have about 1.2–1.5-fold higher prevalence or incidence of PD than women overall [33–35]. Also, A 2022 meta-analysis of 32 studies found an overall male: female prevalence ratio of 1.18 (95% CI 1.03–1.36), with some regional variation and a trend toward narrowing over time [36]. Several hypotheses have been postulated to explain this difference. Experimental and epidemiologic data support neuroprotective, anti-inflammatory, antioxidant effects of estrogens on dopaminergic neurons; longer estrogen exposure (later menopause) is linked to lower PD risk [37–39]. Testosterone effects are complex; some data suggest it may increase dopaminergic vulnerability and α-synuclein pathology in males, and SRY expression in nigral neurons may enhance stress responses [37, 38]. Furthermore, men more often have pesticide, solvent, rural/agricultural work, and head-injury exposure, all PD risk factors; changing work and lifestyle patterns may be reducing the sex gap [33, 40].

The most frequent comorbidity was hypertension, found in 35.5% of participants. Likewise, there is a high prevalence of hypertension among the adult population in Cameroon, with an estimated prevalence reaching 30.9% [41]. Furthermore, some studies, including meta-analysis, have suggested that hypertension could constitute a risk factor for PD [42–44]. However, the mechanism underlying such an association remains to be clearly elucidated.

We found a hospital prevalence of Parkinson's disease of 4.27% at the Neurology department of the YCH. In hospital-based studies in West Africa, Parkinsonism accounts for 6.0-8.3% of neurological admissions/consultations; PD specifically 0.4-6.9% of such admissions [45]. Across SSA, hospital-based prevalence of Parkinsonism ranges 0.41-7.2% of neurological admissions/consultations [11]. Conversely, community-based studies in SSA reported crude prevalence ranging roughly from 7-20 per 100,000 in earlier reviews, up to around 40 per 100,000 after age-standardisation in rural Tanzania [14-28]. Thus, hospital-based series show a higher proportion of PD among neurology patients than community surveys show in the general population. This is driven by younger underlying populations, under-ascertainment, barriers to specialist care, and a larger denominator in the community. Also, community surveys sometimes use non-specific screening tools that can miss mild or atypical PD. Moreover, Western Europe, North America and Australia commonly report about 100-200+ per 100,000 in all-age studies, and >1,000 per 100,000 in those ≥70 years [29-46]. In 2016, age-standardised PD prevalence varied over fivefold across countries, with the lowest rates in sub-Saharan Africa and the highest in high-income North America [8]. This disparity could be accounted for by many factors. There is a much younger population structure in SSA, with <5% of the population ≥65 years, versus ~18-20% in many Western countries, sharply lowering crude prevalence of an age-dependent disease [28]. Also, we have underdiagnosis and low case

ascertainment in SSA. Few neurologists, low awareness, and misattribution of tremor/slowness to "normal ageing" mean many cases are never diagnosed or recorded [18]. Furthermore, there is a possibility of survival and treatment effects. Limited access to levodopa and specialist care may shorten survival, reducing point prevalence compared with treated Western cohorts [14].

Diagnosis of PD was made using the UKPDS Brain Bank Clinical Diagnostic criteria. We found out the most common symptoms of parkinsonism was bradykinesia and rest tremor (96.77% each). This is similar to the study carried out by Khalid and al. in Sudan except for the lower frequency of rest tremor [26]. The most common symptom of parkinsonism of the their population was bradykinesia (93.6%) followed by cog-wheel rigidity (84.04%) then tremor (82.98%) with few patients with postural instability(77.66%). Our results are also different from the findings of Okunoye and al. in Nigeria where out of 36 patients with PD, all (100%) had bradykinesia, 34 (94.4 %) had tremors while gait abnormalities and imbalance were found in 32 (88.9%) [47]. This could be explained by the fact that the tremor-dominant type was the most common type of PD in our setting.

For the non-motor symptoms, the cognitive impairment was found in 22.58% of participants. Ogbimi *et al*., in a tertiary health facility in Nigeria, found a high prevalence of 50% [48]. This discrepancy could be explained by the fact that they used the Community Screening Instrument for Dementia (CSID), which is a more elaborate screening tool for cognitive assessment. Hallucinations were present in 6.5% of participants. A 2018 meta-analysis reports a pooled proportion of 8.9% of auditory hallucinations and 28.2% of verbal hallucinations [49]. This lower proportion in our population could be due to the lower proportion of those with an advanced stage of the disease, for hallucinations are more frequent in advanced stages [50]. Anxiety and depression were each present in 22.6% of participants. Literature reveals the prevalence of depression of about 15-40% [51–53], and a prevalence of anxiety of about 30-60% [52–54] with frequent cooccurrence of both conditions. Both strongly and independently worsen the quality of life [51-55], yet reviews emphasize that psychiatric conditions in PD in SSA are largely understudied, underdiagnosed, and undertreated, with limited specialist services and almost no systematic psychiatric assessment [28].

Insomnia and daytime sleepiness were present in 32.26% and 38.71% of participants, respectively. This corroborates studies showing that insomnia in PD is about 27-80% (pooled about 40-45%) prevalent, and excessive daytime sleepiness of about 21-76% (pooled about 36%) prevalent [56–59]. Proposed explanatory mechanisms and predisposing factors include neurodegeneration of sleep-wake regulatory circuits and risk factors like longer disease duration, worse motor/autonomic scores, male sex, anxiety, depression, and drugs (levodopa and dopamine agonist) [56-61].

In autonomic dysfunctions, the common symptoms by order of frequency were: cardiovascular problems [orthostatic hypotension (20 patients,64.52%)], followed by gastrointestinal problems [slight to moderate constipation problems (13 patients, 41.94%) slight to moderate sialorrhea (10 patients, 32.26%) mild to moderate dysphagia (4 patients,13.3%)] and finally urinary dysfunctions [slight to moderate urinary problems (12 patients, 38.71%)]. This is similar to what is reported by Chen *et al*., [62]. In their review of autonomic dysfunction in PD, they reported 88.9% of patients will develop gastrointestinal problems, 40% of patients develop cardiovascular problems, and 25-85% of patients develop urinary dysfunction. Our study records lower frequencies, given the proportion of patients with an advanced stage of the disease.

The Hoen/Yahr (H&Y) scale showed most patients were at stage 2 of disease progression and fewer elsewhere, with the MDS-UPDRS also showing the severity of functional disability to be mild. Likewise, studies in Nigeria and Tanzania found that most patients were in stages 2 and 3, and fewer in stage 1 [15-48]. However, European/American cohorts typically have most patients in H&Y 2-3 as well, but with relatively more stage-1 cases. These point to late diagnosis in African settings, likely reflecting access barriers.

CONCLUSION

At the end of this study, we can draw the following conclusions:

- The hospital prevalence of PD at the Yaoundé Central Hospital was 4.27%.
- Hypertension is the most common comorbidity
- The main clinical manifestations of PD were bradykinesia and rest tremor, followed by cog-wheel rigidity and non-ataxic postural instability (less common).
- The common non-motor symptoms were fatigue, autonomic dysfunctions (orthostatic hypotension, constipation problems, urinary problems, sialorrhea, and dysphagia)
- Most patients were at stage 2 according to the H&Y scale

Availability of Data and Material

All collected data is confidentially kept at the Brain Research African Initiative, Cameroon. The datasets are available from the corresponding author on reasonable request.

Declaration of Competing Interest: The authors declare no competing interests.

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Author's Contribution

LN, AKN, and JOND conceived this work. JOND and LN collected data and analysed. LN wrote the first draft, and all authors reviewed and approved the work.

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