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Neuropsychiatric symptoms in Nigerian patients with Parkinson's disease

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Background – Neuropsychiatric symptoms are common in Parkinson's disease and may precede onset of motor symptoms. They are also known to increase caregiver's burden. *Objective* – The aim of this study was to assess neuropsychiatric symptoms in a cohort of Nigerian patients with idiopathic Parkinson's disease and compare with systemic hypertension. *Method* – Fifty patients with idiopathic Parkinson's disease were compared with fifty demographically matched controls with systemic hypertension. Diagnosis of Parkinson's disease was based on the United Kingdom Parkinson Disease Society (UKPDS) Brain Bank Clinical diagnostic Criteria. Diagnosis of hypertension was based on recorded blood pressure of $\geq$140/90 mmHg on two different occasions. The Neuropsychiatric Inventory (NPI) was applied to caregivers of both patients and controls. *Results* – There were significant differences in frequency of neuropsychiatric symptoms in patients and controls ($P < 0.05$). Significant differences were found in mean distress scores for some neuropsychiatric symptoms and the total mean distress score. In all cases, patients with Parkinson's disease had higher scores when compared with controls. Severity of motor symptoms, as measured by the UKPDS, correlated with total NPI severity scores ($P = 0.000$). *Conclusion* – Neuropsychiatric symptoms occur more frequently in Parkinson's disease than matched controls, and the presence of these symptoms is associated with caregivers' distress. There is a need for early and adequate treatment for motor and behavioural symptoms of Parkinson's disease.

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Significant outcome

Neuropsychiatric symptoms are severe and more distressful to caregivers of patients with Parkinson's disease compared with matched controls with systemic hypertension.

Introduction

Idiopathic Parkinson's disease was originally described as a predominantly motor disorder with no involvement of non-motor functions such as cognition and behaviour. However, neuropsychiatric disturbances in Parkinson's disease are now well recognized and documented and may precede the more dramatic motor symptoms that are characteristic of the disease (1, 2). The occurrence of neuropsychiatric symptoms in Parkinson's disease contributes to a poorer quality of life of patients, a worse course of disease and caregivers' burden (3, 4).

About 90% of patients with Parkinson's disease will have at least one neuropsychiatric symptom during the course of the disease (5). The prevalence of neuropsychiatric symptoms will, however, vary depending on the methodology of the study. Standardized psychiatric interview designed to assess psychiatric symptoms in the general population may not be suitable when considering patients with a neurodegenerative disorder like Parkinson's disease. This is because many of the psychiatric symptoms in Parkinson's disease may be

confounded with its motor symptoms and other non-psychiatric comorbidities, such as autonomic dysfunction. This makes the sensitivity and specificity of psychiatric symptoms for categorical diagnosis uncertain in Parkinson's disease and, indeed, in similar neurodegenerative disorders, such as Alzheimer's disease, unreliable (6, 7).

Although Parkinson's disease is a recognized risk factor for the development of psychiatric symptoms, studies have also shown that having a psychiatric disorder is also an appreciable risk factor for the development of Parkinson's disease, particularly in people under the age of 50 years (8). In addition, as a consequence of treatment, dopaminergic medications may lead to hypersensitivity of dopamine receptors in the mesocortical and mesolimbic pathways leading to psychotic symptoms. Other important risk factors for neuropsychiatric symptoms in Parkinson's disease are increasing age, severity of motor symptom, cognitive impairment, reduced visual acuity and delirium (5, 8). Mood, anxiety and cognitive disturbances are common and may precede the onset of motor symptoms by many years (1, 2, 9). Psychotic symptoms occur more commonly during treatment with dopamine agonist, although psychosis in Parkinson's disease was already described in the prelevodopa era (10). Sleep disturbance is, however, the most prevalent non-motor symptom in Parkinson's disease, as nearly 80% of patients with Parkinson's disease have some type of sleep difficulty, and virtually, all patients with Parkinson's disease will experience some sleep difficulties during the course of the disease (2, 7).

There is little or no information on the psychopathology of Parkinson disease among indigenous Africans, whereas the psychopathology of dementia has been fairly well studied in the Nigerian population (11, 12). Previous clinical studies on Parkinson's disease in this region have focused largely on prevalence (13), autonomic disturbances (14) and cognitive impairments (9). As dementia and Parkinson's disease are known to share similar range of histopathological and clinical features, with Parkinson's disease sometimes described as a Lewy body spectrum disorder (15, 16), it becomes pertinent to examine the psychopathology of indigenous Africans with Parkinson's disease.

Aim of the study

This study compares frequency, severity and correlates of neuropsychiatric symptoms, as well as the caregivers' distress in a cohort of Nigerians with idiopathic Parkinson's disease, with those of patients with systemic hypertension.

Method

Subjects

The study population comprised 50 patients with a clinical diagnosis of idiopathic Parkinson's disease who were recruited consecutively from the neurology clinics of the University College Hospital (UCH), Ibadan, and the Federal Medical Centre (FMC), Abeokuta. The study locations are in south-western Nigeria and about 80 km apart. Both locations are tertiary hospitals with departments of medicine, obstetrics and gynaecology, surgery and psychiatry. The study was conducted over a 6-month period between July and December 2009. The diagnosis of idiopathic Parkinson's disease was made by a neurologist and later reviewed to ensure it conforms with the United Kingdom Parkinson's Disease Society (UKPDS) Brain Bank Clinical Diagnostic Criteria. Patients with a history of cerebrovascular disease, head injury, previous encephalitis, drug or alcohol abuse and those who have had neuroleptic drug treatment within 6 months before interview or a personal history of psychiatric illness were excluded. Also excluded were patients with features of dysautonomia, supranuclear gaze palsy, cerebella signs or negative response to levodopa (L-dopa). Parkinson's disease patients with severe comorbidities capable of causing neuropsychiatric symptoms (e.g. chronic kidney disease, cardiac and liver diseases, and diabetes mellitus) were also excluded. No effort was made to diagnose or exclude patients with cognitive impairment due to Parkinson's disease.

A control group of 50 subjects matched by age, sex and level of education was also recruited. They consisted of volunteering patients attending the general outpatient clinics at the two study locations and who were previously diagnosed hypertensives [based on self-report of use of antihypertensive medications and hospital records of previous diagnosis made by a specialist physician based on blood pressure $\geq 140/90$ mmHg taken on at least two separate occasions]. However, those recruited into the study had their blood pressure controlled for at least 6 months prior to recruitment. Blood pressure control was defined as systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg. They were also without parkinsonism or other comorbidities like diabetes mellitus, chronic kidney and liver diseases based on historical account and detailed physical examination. The choice of patients with controlled systemic hypertension was to match the study group with another outpatient group with a chronic condition not associated with parkinsonism. The matching

procedure was adopted to ensure that the control subjects were similar to the patients with Parkinson's disease in every respect except for the disease under investigation. Regular outpatient attendees with chronic conditions (including systemic hypertension) are frequently accompanied by relatives or other caregivers to the study locations. This group of carers provide ongoing emotional support to patients and ensure compliance with treatment, although patients with systemic hypertension are not expected to have a burden significantly higher than those in the general population.

Informed consent was obtained from all subjects and their caregivers. Ethical approval for the study was obtained from the Joint Ethical Committees of the University of Ibadan and the University College Hospital Ibadan.

Neuropsychiatric assessment instruments

Psychopathology in patients with Parkinson's disease and controls was assessed using the Neuropsychiatric Inventory (NPI) (17). The Neuropsychiatric Inventory is a standardized instrument specifically designed for the assessment of psychopathology in patients with dementia but has been applied to other neurodegenerative disorders like Parkinson's disease. Information is obtained from a caregiver familiar with the patient. The NPI assesses frequency, severity and the amount of caregivers' distress experienced due to each neuropsychiatric symptom. The neuropsychiatric symptoms assessed include delusion, hallucination, agitation/aggression, depression, anxiety, elation, apathy/indifference, disinhibition, aberrant motor behaviour, night-time behaviour and appetite change. Frequency was scored in the following manner: 0 = not present, 1 = occasionally, 2 = often, 3 = frequent, 4 = very frequent. Severity was scored as 1 = mild, 2 = moderate, 3 = marked. Because it is possible for a symptom to be present many times without being severe or occur occasionally with high severity, a severity score consisted of the product of the frequency × severity. Distress was measured as follows: 0 = not at all, 1 = minimal, 2 = mild, 3 = moderate, 4 = severe and 5 = very severe. The NPI has been validated among Yoruba-speaking Nigerians, who predominate our study population. This version of the NPI has good interrater and test–retest reliability and good internal consistency (Cronbach's alpha ranged from 0.73 to 0.79) (12).

Mini-mental state examination

Cognitive assessment was performed using the Mini-Mental State Examination (MMSE). The version of the MMSE used in this study consists of 20 items assessing orientation to time and place, registration and recall, counting forward and backward, mental calculation, abstraction and judgment. Age- and education-specific norms of this version have been established in elderly Yoruba-speaking Nigerians and as part of the Consortium to Establish a Registry for Alzheimer's Disease Neuropsychological Battery (CERAD-IB) (18).

The Unified Parkinson's Disease Rating Scale (UPDRS)

The Unified Parkinson's Disease Rating Scale (UPDRS) has three subscales, as well as the physical sign score scale. The subscales include the mentation score (UPDRS I), activities of daily living score (UPDRS II) and the motor score (UPDRS III). The UPDRS motor scale is a 27-item scale that is widely used for detailed examination of motor symptoms in Parkinson's disease. This scale has been validated in a cohort of Nigerian patients with Parkinson's disease (9).

The test procedure

The study protocol was pretested on ten subjects and subsequently applied to all subjects thereafter. MMSE and UPDRS were administered to the subjects and controls, and the NPI was administered to caregivers of both subjects and controls. All questionnaires were administered by one of us, a psychiatrist who had previous training and experience in their use.

Data management and analysis

Data were analysed using the Statistical Package for the Social Sciences version 15.0 (SPSS 15.0; SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for all variables. For continuous variables, means, ranges and standard deviations were calculated. Descriptive statistics for categorical variables included proportions for binary data and the number and frequency in each category. Chi-square test was used to test the difference between groups. Student's *t*-test was used to find the difference between means. Comparison of the demographic and clinical variables in Parkinson's disease subjects and the NPI total severity scores was achieved using the Student's *t*-test or analysis of variance (ANOVA) where applicable. Spearman correlation coefficient was calculated between NPI total scores and other continuous variables. Values of $P < 0.05$ were considered statistically significant.

Results

There were 28 male (56.0%) and 22 female (44.0%) subjects with Parkinson's disease. Their mean age was 65.4 ± 9.4 years. Twelve (24.0%) subjects with Parkinson's disease had no formal education, while 13 (2 6.0%) of them had up to 6 years of education. The remaining 25 (50.0%) had more than 6 years of formal education. There were no significant differences between patients and controls in terms of gender ($P = 0.45$), age at presentation ($P = 0.79$) or level of education ($P = 0.93$).Primary school education lasts for 6 years in Nigeria, and this is expected to make one literate.

Among the subjects with Parkinson's disease, the mean age at onset was 62.1 ± 10.2 years, whereas the mean duration of disease was 41.2 ± 31.6 months. The demographic and clinical characteristics of subjects with Parkinson's disease are shown in Table 1.

Twenty-seven (54.0%) of the caregivers of subjects with Parkinson's disease were men, while 23 (46.0%) were women. Mean age of these caregivers was 40.5 ± 14.2 years. Most caregivers were between the ages of 30 and 59 years. In all, 42 (84%) of the caregivers were family members of the patients. Among these were 17 sons and 10 daughters. Eleven of these caregivers were spouses, while the remaining four were younger siblings of the patients. The remaining 8 (16.0%) caregivers were non-family members, including neighbours, friends and domestic assistants who had no professional training. Thirty-two (64.0%) caregivers lived with the patients One caregiver did not live with the patient but saw him daily. Seventeen (34.0%) caregivers saw their care recipient less frequently. Twenty-five (50.0%) of the caregivers of patients with Parkinson's disease had college or university education, while another 11 (22.0%) completed high school.

Table 1 Characteristics of subjects with Parkinson's disease, controls and caregivers

Characteristics	Patients with PD	Control group	*P*-value
Age (years) mean (±SD)	65.6 (± 9.4)	66.14 (± 9.2)	0.789
Gender (%)			
Male	56.0	66.0	0.305
Females	44.0	34.0	
Education formal			
0 years	24.0	32.0	0.927
6 years	26.0	22.0	
>6 years	50.0	46.0	
MMSE (scores) mean (±SD)	22.2 (±SD 5.8)	23.08 (±SD 4.5)	0.406
UPDRS (scores) mean (±SD)	42.1(± SD 17.8)	4.2 (±SD 7.0)	0.000

In the control group, 18 (36.0%%) of the caregivers were men, while 32 (64.0%) were women. Mean age of the caregivers was 41.1 ± 17.0 years. Only 30 (60.0%) of the controls were family members. Among these were fifteen daughters and 15 spouses. The other caregivers of controls were either neighbours or domestic staff of the patients. In all, 38 (76.0%) caregivers of controls lived with subjects. Twenty-one (42.0%) had college or university education, while 18 (36.0%) completed high school.

Thirty-seven subjects with Parkinson disease and 32 controls had at least one neuropsychiatric symptom. Delusions, hallucinations, agitation, apathy and appetite change were significantly more frequently reported in patients with Parkinson's disease compared with patients with systemic hypertension, with irritability being marginal as shown in Table 2.

When we compared severity scores, some symptoms that were significantly different in frequency between Parkinson disease and systemic hypertension did not reach level of significance in severity. In summary, only irritability, appetite change and total severity score showed differences between the two groups, and in each case, mean score for Parkinson's disease was worse than for systemic hypertension. The mean total NPI severity score of the patients with Parkinson's disease and those in the control group was 9.4 ± 10.6 and 3.5 ± 7.65, respectively, $P = 0.002$.

Mean severity score for irritability in Parkinson's patient was 0.76 vs 0.10 for systemic hypertension, $P = 0.007$. For appetite change, mean score was 1.08 for Parkinson's disease and 0.02 for systemic hypertension, $P = 0.003$, Tables 2 and 3 show the pattern of neuropsychiatric symptoms as measured by the NPI among patients with Parkinson's disease and those in the control group.

The data on distress to caregivers are, however, intriguing. It would appear that a different set of symptoms were significantly distressful apart from appetite change (previously observed under severity). Mean score for Parkinson's disease was 0.64 and that for systemic hypertension was 0.02, $P = 0.003$. Other symptoms with significant differences were as follows: agitation, mean score for Parkinson's disease was 0.54 while that for systemic hypertension was 0.08, $P = 0.015$; hallucinations, mean score for Parkinson's disease was 0.24, while it was 0.00 for systemic hypertension, $P = 0.036$. Delusion was 0.50 for Parkinson's disease and systemic hypertension 0.16, $P = 0.049$. Mean score for apathy was 0.62 for Parkinson's disease and 0.18 for systemic hypertension $P = 0.031$. A curious observation is in symptoms

Table 2 Frequency, severity and distress scores for neuropsychiatric symptoms in Parkinson's disease and controls

Characteristics	Patients (%)	Control group (%)	χ^2 (*P*-value)
Delusions	13 (26.0)	3 (6.0)	7.44 (0.006)
Hallucinations	5 (10.0)	0 (0.0)	5.26 (0.022)
Agitations.	10 (20.0)	2 (4.0)	6.06 (0.014)
Depression	23 (46.0)	17 (34.0)	1.50 (0.221)
Anxiety	11 (22.0)	12 (24.0)	0.06 (0.812)
Elation	3 (6.0)	0 (0.0)	3.09 (0.079)
Apathy	14 (28.0)	4 (8.0)	6.78 (0.009)
Disinhibition.	1 (2.0)	1 (2.0)	0.00 (1.000)
Irritability	11 (22.0)	4 (8.0)	3.84 (0.050)
Aberrant motor behaviour	3 (6.0)	2 (4.0)	0.21 (0.646)
Night-time behaviour	15 (30.0)	16 (32.0)	0.05 (0.829)
Appetite change	13 (26.0)	2 (4.0)	9.49 (0.002)
	Mean(SD)	Mean (SD	*P*-value
Severity scores			
Delusion	0.88 (2.02)	0.24 (1.30)	1.89 (0.062)
Hallucinations	0.36 (1.74)	0.00 (0.00)	1.47 (0.146)
Agitations	0.54 (1.91)	0.18 (1.14)	1.16 (0.255)
Depression	1.42 (2.24)	0.68 (1.82)	1.81 (0.073)
Anxiety	1.00 (2.12)	0.44 (1.22)	1.62 (0.108)
Elation	0.22 (0.98)	0.00 (0.00)	1.60 (0.114)
Apathy	1.64 (3.52)	0.54 (2.38)	1.83 (0.070)
Disinhibition.	0.04 (0.28)	0.02 (0.14)	0.45 (0.656)
Irritability	0.76 (1.67)	0.10 (0.36)	2.73 (0.007)
Aberrant motor behaviour.	0.28 (1.21)	0.24 (1.19)	0.17 (0.868)
Night-time behaviour.	1.02 (2.33)	1.06 (2.41)	0.08 (0.933)
Appetite change.	1.08 (2.40)	0.02 (0.14)	3.11 (0.003)
Total severity score	9.36 (10.57)	3.54 (7.65)	3.16 (0.002)
Caregivers' distress			
Delusion	0.50 (1.06)	0.16 (0.58)	1.99 (0.049)
Hallucinations	0.24 (0.80)	0.00 (0.00)	2.12 (0.036)
Agitations	0.54 (1.18)	0.08 (0.57)	2.48 (0.015)
Depression	0.86 (1.26)	0.22 (0.74)	3.10 (0.003)
Anxiety	0.44 (1.01)	0.14 (0.41)	1.94 (0.055)
Elation	0.12 (0.63)	0.00 (0.00)	1.35 (0.179)
Apathy	0.62 (1.21)	0.18 (0.75)	2.19 (0.031)
Disinhibition.	0.04 (0.28)	0.02 (0.20)	1.00 (0.320)
Irritability	0.44 (1.03)	0.12 (0.59)	1.90 (0.061)
Aberrant motor behaviour.	0.10 (0.51)	0.08 (0.40)	0.22 (0.826)
Night-time behaviour	0.42 (1.07)	0.36 (0.83)	0.31 (0.745)
Appetite change	0.64 (1.41)	0.02 (0.14)	3.09 (0.003)
Total NPI caregivers' distress.	5.1 (7.18)	1.36 (2.86)	3.42 (0.001)

of depression in which there was no significant difference between ratings of caregivers for frequency and severity, but a difference arose in distress. Patients with Parkinson's disease had a mean score of 0.86 compared with 0.22 for hypertension, $P = 0.003$. Overall mean distress score was higher in caregivers of subjects with Parkinson's disease, 5.1, compared with controls, 1.36, $P = 0.0009$ (Table 2).

The Spearman correlation model was fitted to the data. Variables in the correlation matrix include duration of illness, age of onset, MMSE and UPDRS scores. Duration of illness was dichotomized into < or > 24 months based on a previous study in Nigeria (9). The analysis showed that the total NPI severity scores correlated significantly and positively with the scores for the severity of motor symptoms on the UPDRS ($r = 0.37$, $P = 0.0002$). Age of onset, duration of illness and MMSE sores did not correlate with NPI total severity score.

Table 3 Summary of *P*-values for frequency, severity and caregivers' distress by neuropsychiatric symptoms

Characteristics	Frequency	Severity	Distress
Delusions	0.006**	0.062	0.049*
Hallucinations	0.022*	0.146	0.036*
Agitations	0.014*	0.255	0.015*
Depression	0.221	0.073	0.003**
Anxiety	0.812	0.108	0.055
Elations	0.079	0.114	0.179
Apathy	0.009**	0.070	0.031*
Disinhibition	1.000	0.656	0.320
Irritability	0.050*	0.007**	0.061
Aberrant motor behaviour	0.646	0.868	0.826
Night-time behaviour	0.829	0.933	0.745
Appetite change	0.002**	0.003**	0.003**
NPI Total Score	N/A	0.003**	0.001**

**$P < 0.01$, *$P < 0.05$.

Discussion

To our knowledge, this is the first report on neuropsychiatric symptoms in Parkinson's diseases from Sub-Saharan Africa. Parkinson's disease occurs in late life, and the mean age of 62.06 (±10.23) years in this cohort is similar to a previous study in Nigeria (9) where a mean age of 60.9 years was reported.

In this study, there was no significant difference between MMSE scores of 22.2 (±5.8) and 23.08 (±4.5), respectively, for patients with Parkinson's disease and controls. The reason for this is unclear, but cognitive impairment in Parkinson's disease is known to occur later than motor impairment, even though behavioural symptoms come up early (1, 19). In addition to mean age of 62 and 61 years for both cohorts, it is probably too early to expect the usual cognitive decline associated with ageing. However, the values of 22.2(+5.8) and 23.08(+4.5) show evidence of borderline impairment associated old age. It is also common to find subtle cognitive changes in patients with systemic hypertension as a result of subcortical vascular brain changes (20).

Except for night-time disturbance that has similar rates for frequency and severity in both

Parkinson's disease and controls, all other symptoms were more frequent, more severe or more distressful to caregivers of patients with Parkinson's disease than in those of patients with hypertension. However, these differences did not reach a significant level in all of them. More important is the fact that different symptoms were significant in frequency, severity and distress. For instance, psychotic symptoms such as delusions, agitation and hallucinations were significantly different in frequency, but not in severity. With respect to distress experienced by caregivers, the three symptoms were rated significantly higher in patients with Parkinson's disease than in controls. The same is the story of apathy. It is also important to point out that hallucination and elation were not experienced by patients with systemic hypertension. Irritability was more frequent and more severe in patients with Parkinson's disease compared with the hypertensive but not more distressful, although there is a tendency towards that ($P = 0.061$) Other NPI symptoms such as disinhibition, aberrant motor behaviour and night-time behaviour showed no differences in frequency, severity and distress. Only appetite change showed differences in the three parameters.

Direct comparison between this study and similar studies in Western countries may not be ideal because of the differences in methodology. However, in a series, 80–90% of patients with Parkinson's disease reported sleep disorders (21). Night-time behavioural disturbances were reported in 30% of our sample. Similarly, about 90% of patients with Parkinson's disease had at least one behavioural symptom (5), and the rate in our study is 74%; however, 64% of patients with hypertension had similar symptoms. Depression was the most frequently reported neuropsychiatric symptom found in patients with Parkinson's disease in this study, occurring in 46% compared with 34% in the hypertensive, and no significant difference was observed. Many other studies in the literature have reported depression as the most frequent neuropsychiatric symptom in Parkinson's disease (7, 22). Similarly, high rates of depression had previously been reported among patients with systemic hypertension who had disruption of the subcorticofrontal neural circuitry resulting from microinfarcts and white matter changes (20). The high rate of depression in Parkinson's disease is of particular importance because depression is known to be the main factor impacting on quality of life and mortality (4, 23, 24). It thus follows that we observed no differences between frequency and severity for depression because depression is common in both hypertension and Parkinson's disease; but it is instructive to note that caregivers of patients with Parkinson's disease were more distressed by depression than caregivers of patients with hypertension.

It is not clear why appetite change is rated more frequent, more severe and more distressful in patients with Parkinson's disease. A further look at our data suggests patients with Parkinson's disease may have motor difficulties in feeding, a situation which may follow oropharyngeal rigidity and swallowing difficulties, and associated with drooling of saliva in affected patients, which may cause embarrassment to caregivers. Irritability and appetite change had previously been reported as the more severe symptoms among community-dwelling and nursing home patients with Parkinson's disease (25).

Even though they are not rated as more severe, psychotic symptoms of delusions, hallucinations, agitation and emotional symptoms of apathy were both more frequent and caused significantly more distress to caregivers of patients with Parkinson's disease compared with the hypertensive. This points to the fact that these symptoms are worrisome to caregivers of patient with Parkinson's disease. These symptoms are also important in dementia and lead to caregivers' distress and institutionalization (26). Overall mean distress score was significantly higher in patients with Parkinson's disease. Even though we did not measure psychiatric morbidity directly in the caregivers, the high distress score is an indication of such. A 5-fold increase in psychiatric morbidity among caregivers of patients with Parkinson's disease had been reported in caregivers who had significant distress (27). Psychiatric morbidity measurement in that study was based on the 12-item version of the General Health Questionnaire.

There are interesting parallels between the results of this study and some others that have measured neuropsychiatric symptoms in dementia. Such similarities are probably not surprising as both Parkinson's disease and dementia are accompanied by neuropsychiatric symptoms. The two conditions also have interesting similarities in neuropathology and neurochemistry. More importantly, the NPI was initially designed to measure neuropsychiatric symptoms in dementia and was later adopted to measure the same symptoms in Parkinson's disease and other similar conditions. It is also informative to note that previous studies on dementia reported higher frequency of NPI symptoms (including psychotic symptoms) in demented subjects compared with normal controls (26, 28).

In a recent study by our group, neuropsychiatric symptoms in Nigerian patients with mild cognitive impairment were midway between normal cognition and dementia (29).

This study showed that neuropsychiatric disturbances occur more frequently in Nigerian patients with Parkinson's disease compared with demographically matched hypertensive controls. The presence of neuropsychiatric disturbances is associated with caregivers' distress. Severity of motor symptoms is an important determinant of neuropsychiatric disturbances in Parkinson's disease. This finding has some similarities with reports from Western societies.

Limitations

There are some limitations with this study. One is that even though the NPI is a reliable instrument, the caregiver may not recall all the symptoms or might have denied some because of stigma. Caregivers might also have overestimated subjective distress, especially in patients with Parkinson's disease who have obvious motor disability. Secondly, similar to most clinical studies of Parkinson's disease, there is a minor possibility of misclassification of secondary forms of Parkinsonism as idiopathic Parkinson disease. There is also the likelihood for referral bias where, in this case, the more severely ill patients, including those with behavioural symptom, may have been recruited into such study.

As a consequence of drug treatment, neuropsychiatric symptoms could occur in both patients with Parkinson's disease and controls, but the likelihood is higher in patients with Parkinson's disease.

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Conflict of interest

None of the authors has any conflict of interest.

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