Chapter 2

A Description of Parkinson's Disease in People of African Origin

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Abstract

With the increase in life expectancy of African populations, the burden of degenerative diseases such as Parkinson's disease (PD) has grown. Neurologists are noticing trends in the differences reported in the phenotype of PD among African populations compared to Caucasian counterparts. These differences are chiefly in age of onset and clinical presentation. This chapter focuses on different aspects of the presentation of Parkinson's disease, as they apply to African populations and those of African origin.

Keywords: Parkinson's, African, phenotype, Black

1. Background

African countries have been experiencing rapid changes with increases in life expectancy. This has increased the burden of age-related and neurodegenerative conditions such as Parkinson's disease (PD). Some of the earliest descriptions of Parkinsonian disorders can be traced back to Ancient Egypt, as early as 1350–1200 BC. However, not much is known about idiopathic Parkinson's disease (PD) in Black African populations. The classic description, as we know it, has been derived by studying predominantly Caucasian populations. For decades, there has been anecdotal evidence that the phenotype or description of PD may differ in people of African origin. This chapter focuses on various aspects of PD as they apply to African populations as well as those of African origin.

2. Incidence and prevalence

One of the earliest studies comparing the prevalence of Parkinson's disease was conducted at a hospital in New Orleans [1]. Records were reviewed over a 10-year period, from 1959 to 1969. The patient population was 75% Black. Only patients with a definite diagnosis of PD were included in the study. The study revealed a much lower prevalence of PD in Black patients compared to White patients (0.022 and 0.146%, respectively).

Mayeux and colleagues carried out a population-based study to determine the prevalence of Parkinson's disease in Washington Heights in New York [2]. The study was conducted from January 1988 to December 1993. A registry of patients with PD was created by advertising on radio and television. Patients with and without dementia were included in the study. The prevalence of PD was calculated at 99.4 per 100,000. This increased from 2.3 per 100,000 in patients younger than 50 years old to 787.1 per 100,000 in those older than 80 years old. The study demonstrated that age is a powerful risk factor for Parkinson's disease and that it affected men more than women and White people more than non-White people.

Van Eeden and colleagues conducted a study that aimed to determine the incidence of Parkinson's disease by ethnicity, age, and gender [3]. This was the first study of its kind. Newly diagnosed patients between 1994 and 1995 from a large health maintenance organization in Northern California, the Kaiser Permanente Medical Care Program, were included in the study. A total of 588 newly diagnosed with Parkinson's disease were identified from the membership data. These patients were diagnosed according to the Hugh's criteria/modified Core Assessment Program for Intracerebral Transplantation. There was an overall incidence rate of 13.4 per 100,000. This increased significantly over the age of 60. The mean age at diagnosis was 70.5 (38–91) for both men and women. White patients were found to be older at diagnosis compared to Black, Hispanic and Asian patients. The annual incidence of Parkinson's disease was 12% in people under 50 years old and 44% in those over 50 years old. Only 4% of cases overall had onset of disease before the age of 50. The rate of PD was 91% higher in men than in women.

An epidemiological study carried out by Wright Willis et al. in 2010 investigated the geographic and ethnic differences associated with Parkinson's disease [4]. This was a cross-sectional study of Medicare users in the United States, from 65 years and onward. The investigators found that the prevalence of Parkinson's disease in people over 65 years old was just less than 2%. The prevalence also increased with age, without reaching a plateau. A 50% lower prevalence was demonstrated in Black and Asian patients. Black patients appeared to have a higher PD-related morbidity than White patients. This finding has yet to be explained.

Several studies have been conducted in Africa; however, these have mostly been epidemiological studies. In the 1970s, Harries, a neurologist in Kenya, saw a total of 750 patients in his practice over a period of 5 years [5]. He observed that only 4% (27) of patients had a diagnosis of PD during this time. The mean age was fairly young, with an age range of 45–60 years.

Around the same time, Collomb, a British neurologist working in Senegal, compared the patients from his practice with patients he had seen previously in the United Kingdom [5]. He reported that, over a 10-year period, the prevalence of Parkinson's disease among both in and

out patients was less than 1%. He also noted that in patients with typical Parkinson's disease, 25% of the patients had a much slower disease progression than the patients he had worked with while in England.

Lombard and Gefland conducted a retrospective review of Black patients admitted with Parkinson's disease to a hospital in Harare, Zimbabwe, between 1973 and 1976 and compared them with admissions of White patients to Andrew Fleming Hospital in the same city [5]. Out of 82,000 Black patients admitted to hospital, 17 cases of PD were found, compared to 33 cases of PD out of 35,000 White patients admitted.

A systematic review was conducted in 2006, by Okubadejo, which reviewed all African studies published between 1944 and 2004 [6]. These studies originated from 13 African countries. The analysis revealed that the prevalence of PD in African populations appeared to be lower than their North American and European counterparts.

In 2010, the same group published results of a study that sought to investigate the clinical profile of Parkinson's disease in a population of patients in Lagos, Nigeria [7]. These results were extracted from a database collected over 10 years. Of the 124 patients with Parkinsonism, 98 (79%) had idiopathic Parkinson's disease, while 26 (21%) had secondary PD. The results showed a similar disease profile to European counterparts, although there were fewer patients with early onset disease (<50 years old) and family history. Only 1% of all patients had a family history of PD. The frequency of young onset PD was 16%. In terms of clinical presentation, 32% were tremor-predominant, 55% were mixed, and 14% had an akinetic-rigid presentation. These different clinical presentations were not compared for gender. An important observation was that, compared to European studies, there was a greater delay in diagnosis. One of the negative aspects of this study was that patients with secondary Parkinson's disease were not excluded from the study.

Of the first few studies that have come out of South Africa, most have been prevalence studies. Cosnett and Bill published an observational study in 1988, which included 2638 patients from three major hospitals in Durban, South Africa [8]. This was the first of its kind in South Africa. The prevalence of Parkinson's disease was determined by calculating the frequency of levodopa usage, as well as the number of patients diagnosed with Parkinson's disease. This was compared to the total number of patients seen at each hospital. To exclude recruitment bias caused by fewer Black people seeking medical care, investigators compared the prevalence of motor neuron disease and secondary Parkinson's. The rates of these illnesses were similar in both Black and White populations. The results showed a lower prevalence of PD in Black patients compared to White patients. One of the theories was that the lower life expectancy of the Black population in the area meant that Black people did not live long enough to develop PD.

3. Heredity and age of onset

To date, studies of Parkinson's disease in African populations have shown a lower incidence and prevalence compared to European and North American populations. The findings regarding the frequency of early onset Parkinson's disease (EOPD) in Black patients have been inconsistent. A

family history of PD is associated more frequently with a younger onset, but is found in a significant percentage of late onset PD (LOPD) as well. There is also a greater delay in diagnosis of PD in Africa. None of these earlier studies done in Africa looked specifically at whether PD patients had a family history. In recent years, there has been surge in research of Parkinson's disease in Africa.

In 2012, a group from the Neurology Department in a Western Cape Hospital, South Africa, conducted a study to just answer this question [9]. Van Der Merwe and others investigated the factors associated with early onset (EOPD) and late onset Parkinson's disease (LOPD). EOPD was defined as an age of onset (AOO) of 50 years old or younger, and LOPD as an age of onset over 50. The data were derived from a genetic study run over a period of 5 years. Three hundred and ninety-seven unrelated patients of different ethnic groups were recruited. The study reported a high incidence of early onset PD and significant family history in South African patients (34.8%). EOPD was found to be more frequent in Black (7.2%), White Afrikaner (39.7%), and mixed-ancestry participants (27.0%) compared to White English-speaking patients (24.3%). A positive family history was also associated with an earlier onset. However, a third of LOPD cases had a significant family history as well. This challenges the assumption that LOPD is purely sporadic. Gender had no measurable effect on age of onset. This was congruent with other recent literature (**Figure 1**).

Mahne et al. published a study in June 2016, which aimed to describe both clinical and genetic findings in a group of Black South African patients with Parkinson's disease [10]. All Black patients with PD who attended Steve Biko Academic Hospital were offered participation in the study. A total of 16 patients were included in the study. Three patients had a positive family history but only one of these patients had an identifiable genetic mutation, Parkin1. This

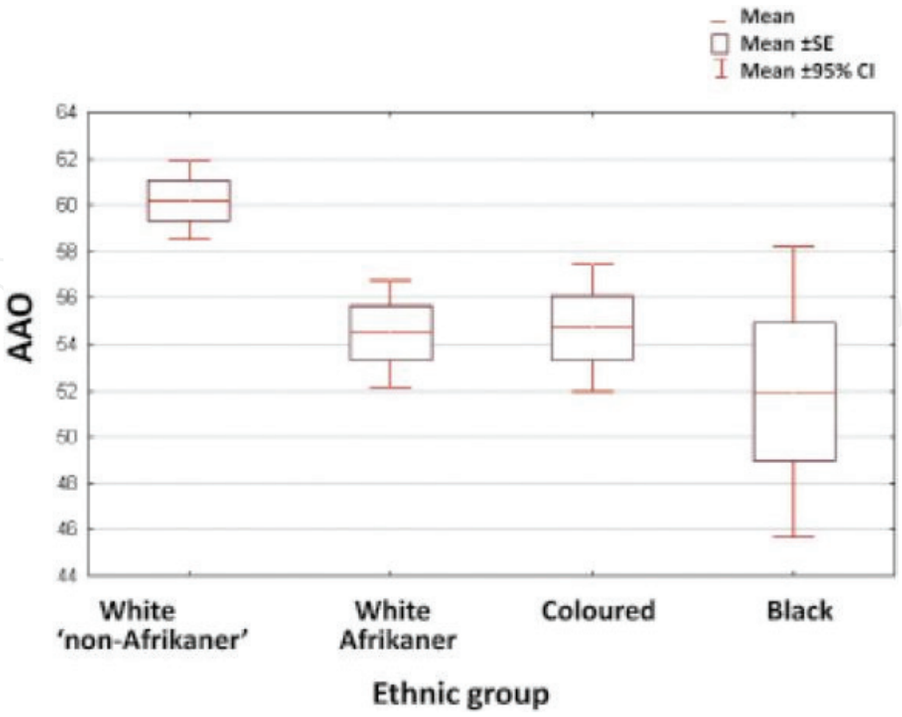

Figure 1. Box-and-Whisker plots of age of onset of PD versus ethnicity. Data are represented as means [9].

	Black (n = 35)			White (n = 11)			p-value
	Mean	**Range**	**95% CI**	**Mean**	**Range**	**95% CI**	
Age	60.8	51–76	55.8–65.8	67.2	44–83	61.6–72.8	0.089
AOO	54.31	12–78	49.6–59	60.7	43–78	53.5–67.9	0.164
TTDx	20.3	0–120	53.5–67.9	56.7	0–360	22.8–136.3	0.33
MMSE	25	15–90	20.9–29:2	24.6	13–30	20.9–28.3	1.0
H&Y	2.5	1–5	2.2–2.8	2.45	1–5	1.6–3.3	0.75
S&E	61.8	10–90	53.6–70.0	66	20–90	43.1–89	0.51

AOO = age; TTDx = time to diagnosis; MMSE = mini mental state examination; H&Y = Hoehn and Yahr score; S&E = Schwab and England activities of daily living scale.

Table 1. Demographic and illness staging differences [11].

is mounting evidence that genetics is important in the Parkinson's disease but the studies to date have not been large enough to adequately investigate this. The study by Smith and Modi revealed that a third of Black patients had a positive family history compared to 18% of White patients [11]. A third of Black patients had EOPD (**Table 1**).

The studies focusing on African populations are quite outdated. They all report a lower prevalence of Parkinson's disease in Black populations. However, prevalence is a function of time. These populations had a shorter life expectancy and so this may have influenced prevalence rates. As life expectancy of African populations increases, the increase in the aging population may translate into an increased burden of degenerative diseases such as Parkinson's disease.

What appears consistently throughout these studies is that disease onset appears earlier in Black patients. It is possible that this difference has a genetic basis; however, this theory has yet to be examined further.

4. Phenotype of idiopathic Parkinson's disease

When talking about the phenotype of Parkinson's disease, we describe the cardinal symptoms which dominate the clinical symptoms. According to the Queens Square Brain Bank criteria, bradykinesia is the hallmark of Parkinson's disease. Other cardinal features include resting tremor, muscle rigidity, postural instability, and asymmetry of symptoms. Typically, symptoms are mixed, although rigidity or tremor may predominate. Mixed and tremor predominant types are the most frequent presentation. An akinetic-rigid syndrome, Parkinson-plus disorder having been excluded, is a far less common presentation.

Neurologists have long speculated that the clinical characteristics of Parkinson's disease may differ between populations of African and European origin. The classic description of Parkinson's disease is the hallmark of bradykinesia, associated with a combination of an asymmetrical resting tremor and muscle rigidity to varying degrees. In 2016, Mahne and colleagues

conducted a small study of 16 Black patients with Parkinson's disease in Pretoria, South Africa [10]. Assessment of the phenotype of Parkinson's disease among patients was not the primary outcome of the study. In terms of clinical presentation, 32% were tremor-predominant, 55% were mixed, and 14% had an akinetic-rigid presentation.

A study published by Smith and Modi in the same year aimed to determine whether ethnicity and gender have a significant impact on the clinical presentation of idiopathic Parkinson's disease (IPD) in a patient population in Johannesburg, South Africa [11]. Until then, there had been no notable studies exploring possible differences in disease phenotype between Black and White patients. Of 146 patients with Parkinson's disease screened, 50 patients of different ethnic groups met the inclusion criteria and participated in the study. Seventy percent were Black African, 22% were of European descent, 6% were of Indian descent, and 2% had mixed ancestry. The mean age of the participants was 63 years old (range 36–83).

The study was conducted in a tertiary hospital, which served a predominantly indigent demographic. As a result, the investigators could not draw conclusions on the differences in cognitive impairment, or prevalence of Parkinson's disease in this population. When comparing the different gender and ethnic groups, the study highlighted specific patterns with regards to differences in phenotypes. The chief differences identified were in age of onset, pattern of rigidity (axial or appendicular), posture, and tremor.

The majority of patients in the study population had the classic presentation of Parkinson's disease. This was defined as a syndrome of late onset with an asymmetrical resting tremor, stooped posture, appendicular rigidity, and bradykinesia. This included 91% of White and 71% of Black patients. However, a subset of patients, particularly Black patients, showed some deviations from the classic phenotype.

Of note, Black patients were more likely to have axial (80%) rather than appendicular rigidity (54%) compared to White patients (45 and 90%, respectively.) They were also more likely to have an erect posture (67%). These two findings were statistically significant (p-values = 0.033 and 0.039, respectively). Furthermore, almost a third of Black patients had an akinetic-rigid presentation. This was particularly prevalent in Black males (54%) (**Table 2**).

	Black	**White**
Mean AAO	56.6	60.7
%EOPD	31	18
%Cognitive impairment	74	18
%Akinetic-rigid syndrome	29	9
%Classic IPD	71	91

AOO = age of onset; EOPD = early onset Parkinson's disease.

Table 2. Chief clinical differences found in this study [11].

Several differences were also noted in presentation between the two gender groups. There was a slight female preponderance of 56%, contrary to the male preponderance described in literature. The clinical phenotype between the two groups was similar except for two noticeable differences. Firstly, axial rigidity was more prevalent in males (96%) compared to females (64%). Secondly, resting tremor was much more frequent in females (94%) compared to males (59%). This was statistically significant (p-value = 0.01). The mean age of onset (AOO) was similar in male and female participants in both racial groups.

The phenotype of Parkinson's disease in the majority of the study population was of the classic type. A subset of Black patients (one third) presented with an akinetic-rigid syndrome. The results of the study showed clear trends in the differences between ethnic and gender groups; however, they were not all statistically significant. This is possibly due to the small sample size and hospital complex bias. A larger sample size and community study is needed to confirm these findings.

5. Cognitive impairment

The 2016 Mahne study showed that out of the 16 patients, 40% had a normal cognition, 40% had minimal cognitive impairment, and 20% had dementia. Cognitive impairment was associated with a higher rigidity score UPDRS. Smith's Johannesburg study showed that cognitive impairment was much more common in Black patients than in White patients. There was a higher incidence of cognitive impairment in Black patients. It is important to note that although all participants had a sufficient level of education to complete the Mini Mental State Examination (MMSE), there may have been some bias because of differences in the quality of education, a legacy of the country's history of racial inequality. It is important to note that the MMSE has a culture bias and is not specific for features of a subcortical dementia, which is found in IPD. However, it is a good screening tool and is easily reproducible. The study showed that 75% of Black patients showing an MMSE score of less than 25 compared to 18% of White patients.

6. Conclusion

Parkinson's disease appears to be much less prevalent in African populations than Caucasian populations. However, it is important to note that a true and widespread prevalence study of Parkinson's disease in Africa has yet to be conducted. Although the classical presentation of PD is still the most common, the akinetic-rigid phenotype can be found in up to one-third of African patient. Patients of African origin have a disease onset much earlier than their Northern Hemisphere counterparts as well. There are currently genetic studies underway that will hopefully shed light on these differences in time.

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