
Hospital Based Epidemiology of Neurodegenerative Disease in Cameroon

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Abstract: Background: The world's population is aging due to a gradual increase in life expectancy. As a result, age related conditions such as neurodegenerative diseases may increase. No previous studies have been carried out on the epidemiological features of these diseases in our country. Objective: The aim of this study was to determine the global prevalence and proportion of each type of neurodegenerative disease, assessing comorbidities and associated factors. Methods: A cross sectional, retrospective descriptive and analytic study over a 15-year period from 2000 to 2014 in the neurological in and out-patients department of the Yaoundé Central Hospital and the Douala General Hospital was carried out. Medical files of patients served as basis for our recruitment. File with four major diagnoses (Parkinsonism, chorea, amyotrophic lateral sclerosis and dementia), made by neurologists were included. Epidemiological, clinical and paraclinical data were recorded for each patient. Results: A total of 54825 new patients were enrolled in both hospitals over the study period. The prevalence of neurodegenerative diseases was 0.74%. Parkinsonism, Dementia, amyotrophic lateral sclerosis and Chorea accounted for 51%, 41.6%, 5.7% and 3.7% respectively. High blood pressure, diabetes, family history of neurodegenerative diseases and age were the major associated factors. Comorbidities such as high blood pressure, diabetes, tobacco consumption, history of stroke were the most common. Conclusion: Neurodegenerative diseases are present in Yaoundé and Douala. Parkinsonism and dementia are more represented. Comorbidities are frequent in patients with degenerative brain diseases.

Keywords: Epidemiology, Neurodegenerative Diseases, Cameroon

1. Introduction

The world's population is aging due to a gradual increase in life expectancy. In Africa, between 2005-2010, life expectancy was estimated at 55.6 years and is expected to reach 68.9 years between 2045 and 2050, 77.1 years between 2095 and 2100 [1]. As a result, age-related diseases such as neurodegenerative disorders (NDs) are expected to expand significantly. NDs are a group of progressive dysfunctions in nerve tissue, leading to the death of neurons and the damage of the nervous system [2]. Depending on the brain structures affected, the disorders affect motor, sensory, autonomic, perceptive and cognitive functions. Neuronal death due to neurodegeneration is faster than what is

observed during normal aging.

Despite many studies focused on these diseases, their causes seemed to be multifactorial. Environmental factors have even been incriminated in several cases [3]. Their evolution is gradual and leads to the loss of autonomy and/or death of patients. The current treatment remains symptomatic and very few drugs act on the disease's progression. They constitute a real public health problem because of disabilities, impact on the family and society, and socioeconomic burden they generate.

In 2005, the number of people with dementia in the world was estimated at 24.3 million, with 4.6 million new cases each year (one case of dementia every seven seconds) [4]. In sub-Saharan Africa the incidence of dementia was between 8.7 and 21.8 per 1000 population per year [5]. Few data are available regarding the

epidemiology of these diseases in our context. In 2006, Kengne et al. in a retrospective study over 9 years (1993-2001) at the Yaoundé General Hospital and University Hospital, found that NDs represented 3.9% of patients in neurology visits including Parkinson's disease, chorea, dementia and amyotrophic lateral sclerosis [6]. Since then, no study was conducted in our community. The evaluation of this phenomenon is needed for the monitoring and the decision-making.

2. Methods

This was a retrospective descriptive and analytical study using the medical records of patients from January 2000 to December 2014. Six months (December 2014 to May 2015) were necessary to examine the archives. The study was conducted in Douala and Yaoundé which are the two main cities of Cameroon. Yaoundé Central hospital and Douala General hospital were both involved in this study. In each hospital, we collected data from the outpatient department (OPD), because all the patients coming for hospital visits are received in the OPD. So, it better reflects the number of patients received in a neurology department.

Patients recruitment: We looked at the medical records of patients with the diagnosis of dementia, parkinsonism, motor neuron disease (MND) and chorea. Sampling was consecutive and exhaustive. All patient records that met the inclusion criteria were considered. The minimum sample size was calculated using the formula described by Kasiulevičius et al, $n = t^2 * p * (1-p) / m^2$ [7]. n represented the minimum sample size to obtain significant results for an event and a fixed level of risk. t represented the confidence interval (CI) (the standard value of the 95% CI will be 1.96), p was the prevalence neurodegenerative diseases, m was the margin of error (usually set at 5%). Considering the prevalence of 3.9% reported by Kengne et al, the minimum sample size estimated was 57 patients [6]. The diagnosis of NDs was made by neurologist. Unusable records were excluded.

Data collection and analysis: After obtaining the administrative authorizations in the target hospitals, we searched successively all the medical records of the neurology department for the period 2000 to 2014. The files relating to the diagnosis of NDs were

retained. The sociodemographic, clinical and paraclinical data of the patients were recorded on a standardized sheet previously designed and tested for this purpose. In the sociodemographic data component, the elements directly associated with NDs such as age, sex. The clinical features included: complains, associated signs and symptoms, comorbidities, physical examination, paraclinical investigations and additional tests performed by the patient and their findings. Apart from the comorbidities revealed by the clinical examination, other comorbidities were found in the results of paraclinical assessment. The diagnosis delay was considered as the time elapsed between the time of onset of the first symptom and the diagnosis of the disease.

Statistical analysis: Data were entered and analysed using the Epi Info software version 3.5.4 for Windows. The different variables of the population were described. The frequency of the different qualitative variables was calculated. Quantitative variables such as age were expressed as mean with standard deviation (SD), median, minimum and maximum.

Ethical considerations: The research protocol was approved to the Institutional Committee on Ethics and Human Health Research of the Faculty of Medicine and Biomedical Sciences (FMBS) of the University of Yaoundé 1.

3. Results

Distribution of NDs

Between January 2000 and December 2014, we identified 54825 patients in the outpatient and outpatient units of the neurology department of the two target hospitals. Of these patients, 406 had the diagnosis of NDs: 161 cases of dementia, 200 cases of Parkinsonism, 23 cases of motor neuron diseases (MND) and 14 cases of chorea. 7 patients had dementia associated to Parkinsonism and 1 patient had dementia associated to chorea. This gives a hospital-based prevalence of 0.74% or 7.4 per 1000 people. 80% of patients were enrolled at the Douala General Hospital. The number of NDs cases increased over time. There was a break in the evolution of the curve. This break was observed between 2001 and 2003 and between 2006 and 2007 (*Figure 1*).

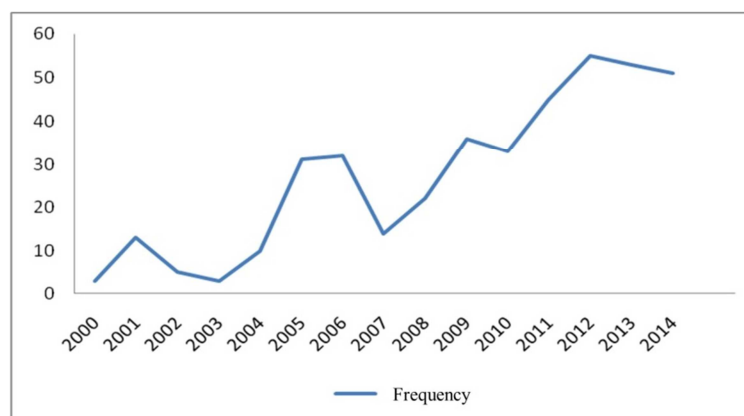


Figure 1. Progression of NDs diagnosis from 2000 to 2014.

Sociodemographic characteristics

The ages of the patients ranged from 8 to 92 years, and the

mean age was 62.77 ± 14.77 years. Men were more represented than women for all age groups and accounted for

59.9% of the population. Before their arrival at the neurologist visit, 6.3% of patients had consulted a traditional

healer. *Figure 2* shows the distribution of the population by gender and age group.

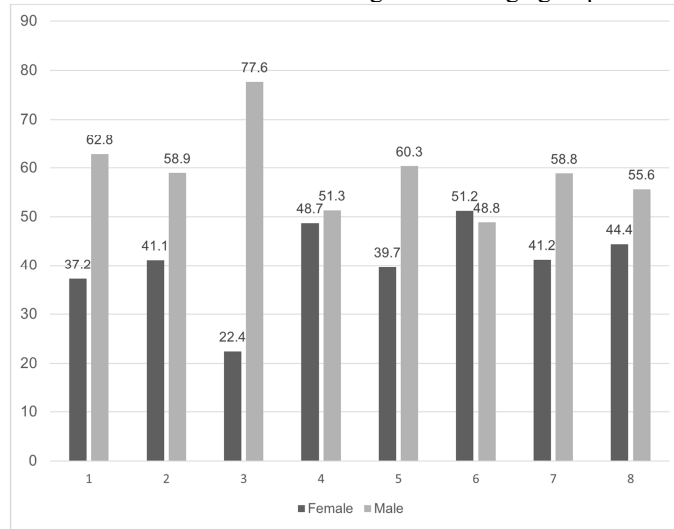


Figure 2. Distribution of NDs according to gender and age groups.

Clinical features

Mean ages at the onset of symptoms ranged from 44 to 64.4 years depending on the type of NDs. The youngest ages were observed in MND group. Mean ages at diagnosis ranged from 45.7 to 68.3 years. The dementia group had the oldest mean ages at diagnosis. The diagnosis was made after

20.5 to 38.4 months of disease progression. The diagnostic delay was lowest in the dementia group. Before coming at the neurological consultation, 90.6% of patients did more than one consultation in primary health care centers and 9.4% went to a traditional healer first. Further details on clinical features are reported on *table 1*.

Table 1. Clinical features of NDs.

	Dementia	Parkinsonism	MND	Chorea
Male/Female	103/66	125/82		
Sex ratio	1.6:1	1.5:1	1.6:1	0.7:1
Age in years				
Min	18	18	16	8
Max	89	92	70	78
Mean age of onset in years (SD)	64.4 (14.8)	58.6 (12.8)	44 (16)	47.6 (24.6)
Mean age of diagnosis in years (SD)	68.3 (11.6)	61.2 (13.8)	45.7 (12.9)	48.2 (20)
Diagnostic delay in months (SD)	20.5 (27)	31.2 (28.6)	41.1 (61.9)	38.4 (27.8)

Paraclinical assessment

Neuroimaging (brain CT scan and MRI) was the main paraclinical investigation done. Electroneuromyography was performed in 2.5% of cases. 2% of patients underwent lumbar puncture for CSF analysis. More details on paraclinical assessment are found in *Figure 3*.

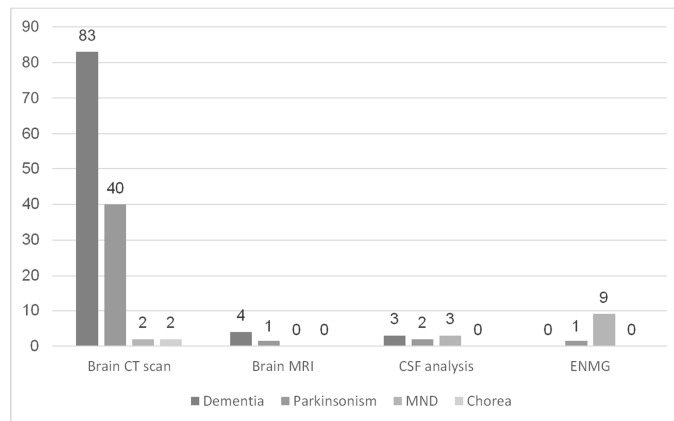


Figure 3. Distribution of paraclinical investigations among NDs groups.

Etiologies

We included in dementia, cases associated to Parkinsonism and chorea. Vascular dementia (VD) and Alzheimer disease (AD) represented 26.6% and 17.8% of dementia's cases respectively. Etiologies of Parkinsonism including cases

associated to dementia were led by Parkinson's disease (PD). ALS was the most frequent MND and Sydenham chorea was leading cause of chorea. In most of the cases, aetiology was not identified. Further details on aetiology are reported in *Table 2*.

Table 2. Etiological patterns of NDs.

	Aetiologies	n (%)
Dementia (n=169)	Vascular dementia	45 (26.6)
	Alzheimer's disease	30 (17.8)
	Mixed dementia	11 (6.5)
	Normal pressure hydrocephalus	6 (3.6)
	Parkinson's disease	2 (1.2)
	Huntington's disease	1 (0.6)
	Neurosyphilis	1 (0.6)
	Multiple system atrophy	1 (0.6)
	Unspecified	72 (42.6)
Parkinsonism (n=207)	Parkinson's disease	114 (55.1)
	Neuroleptic-induced parkinsonism	18 (8.7)
	Vascular parkinsonism	4 (1.9)
	Multiple system atrophy	2 (1.0)
	Unspecified	69 (33.3)
MND (n=23)	Amyotrophic lateral sclerosis	9 (39.1)
	Unspecified	14 (60.9)
Chorea (n=15)	Sydenham chorea	2 (13.3)
	Huntington's disease	1 (6.7)
	Kernicterus	1 (6.7)
	Unspecified	11 (73.3)

Table 3. Comorbidities associated to NDs.

Comorbidities	Dementia	Parkinsonism	MND	Chorea
	N (%)	N (%)	N (%)	N (%)
Hypertension (N=146)	89 (61)	58 (39.7)	1 (0.7)	3 (2.1)
Stroke (n=39)	30 (76.9)	11 (28.2)	-	-
DM (n=45)	29 (64.4)	15 (33.3)	-	2 (4.4)
Smoking (n=21)	11 (52.4)	10 (47.6)	2 (9.5)	2 (9.5)
Dyslipidaemia (n=12)	6 (50)	6 (50)	-	-
Cardiac disease (n=9)	6 (66.7)	4 (44.4)	-	-
Brain trauma (n=8)	3 (37.5)	5 (62.5)	-	-
Overweight (n=4)	2 (50)	3 (75)	-	-
HIV infection (n=3)	3 (100)	-	-	-

DM: diabetes mellitus; HIV: human immunodeficiency virus.

Comorbidities and risk factors

The comorbidities varied from one disease group to another, but four were the most common in the different groups: hypertension, stroke, diabetes mellitus and smoking.

4. Discussion

Neurodegenerative disorders distribution

This study aimed to determine the epidemiological profile of NDs has registered 406 patients in YCH and DGH over 15 years. In order, Parkinsonism, dementia, MND and chorea have been specifically identified. The prevalence found was 0.74% or 7.4 per 1000 patients. The population is aging and age-related diseases such as NDs will grow. Most of the study population was from the HGD (80%). These could be

explained by the fact that during the study period, there were many more neurologists at the DGH than at the YCH. And DGH is in the greatest town in Cameroon in term of population.

Between 2000 and 2014, we counted 406 patients with NDs. Kengne et al. over 9 years of study registered 84 patients [6]. This differences in sample size could be explained by the fact that we covered a larger period in two different town and the number of neurologists and internists who were able to diagnose NDs has regularly increased. In addition, life expectancy in Africa has increased. It went from 38.54 years (1950-1955) to 52.73 years (2005-2010) according to Defo [8].

Parkinsonism

Parkinsonism was the most frequent neurodegenerative

disorder in our study. When including the Parkinsonism associated to dementia, the hospital-based prevalence is 0.38% or 3.8 per 1000 people. The prevalence of Parkinsonism varied from 0.41 to 7.2% of neurological consultation in hospital-based studies [5]. In a systematic review, Okubajo *et al.*, reported a crude prevalence of Parkinsonism and Parkinson's disease (PD) about 7 to 43 per 100,000 people in Africa [9].

The male gender was predominant in our study as reported by Lekoubou *et al.*, who found 53 to 100% of male in their review [5]. This may suggest a protective role of female hormones. The mean age of our patients at clinical onset was 58.6 ± 12.8 years with extremes between 18 and 92 years. These extremes are closed to the results of Lekoubou *et al.*, who found age of clinical onset between 17 to 90 years [5]. This similarity could be explained by some similarities in the demographic profile in Sub-Saharan Africa (SSA). The diagnosis delay for Parkinsonism among our patients was higher than those found in USA [10]. In our country, especially for chronic diseases, patients usually go to the nearest health care facilities or to traditional healers. The diagnosis delay become important when practitioner in primary health care centres are not well trained to properly diagnose and transfer patients to the specialists. The diagnosis of PD is mainly clinical, and it is supported by the response to L-Dopa [11]. Neuroimaging is helpful for differential diagnosis, aetiology and to give some information about the pathological process *in vivo* [12]. Very few patients did brain MRI compared to the brain CT scan. MRI was more expensive than CT scan, and was available only at the DGH.

PD was the leading cause of Parkinsonism in our study, as reported by the literature in Africa [9, 13]. Others pattern were neuroleptic-induced, vascular Parkinsonism and multiple system atrophy (MSA). Okubadejo *et al.*, found in order of frequency PD, vascular parkinsonism, drug-induced parkinsonism, MSA, Lewy body dementia, toxin exposure, progressive supranuclear palsy, hemiparkinsonism-hemiatrophy, juvenile parkinsonism with dystonia and hemiatrophy and primary amyloidosis with parkinsonism [14]. More accurate diagnosis tools could help us to determine other etiologies and reduce the occurrence of unspecified type.

Comorbidities in patients with Parkinsonism were mainly cardiovascular (CV) risk factors in order of frequency hypertension, diabetes mellitus (DM), stroke, dyslipidaemia, cardiac disease and overweight. Brain trauma was also found as comorbidities. Lekoubou *et al.*, reported 38% of atherosclerosis among Nigerian patients with Parkinsonism [5]. This high frequency of CV risk factors can be link to the older age of patients and to the epidemiological transition ongoing in SSA, with the raised of CV diseases [8].

Dementias

Dementias represented the second most frequent ND in this study with a hospital-based prevalence of 0.31% or 3.1 per 1000 people. In SSA, the prevalence of dementia ranged from < 1% to 47.8 in hospital-based studies and from < 1%

to 10.1% in population-based studies [5]. Male were most affected than female in our study. For George-Carey *et al.*, the prevalence of dementia was highest among female aged 80 and above [15]. This difference with our study could be explained by the difference in demographic profile. In addition, vascular (VD) which affects more male than female and occur among most young people than Alzheimer's disease (AD), was the leading cause of dementia in our study. The mean age at diagnosis was 68.3 years for our patients. For Ruitenber *et al.*, after 90 years of age the incidence of AD is higher for women than for men and the incidence of VD is higher for men than for women in all age groups [16]. The diagnosis delay was shorter in dementia group than in other NDs. This could be explained by the fact that dementia rapidly leads to difficulty in quality of life and has an immediate impact on the family. This threaten the caregiver and then come early to hospital.

The frequency of neuroimaging was high in the dementia groups. The certain diagnosis of dementia can only be made post-mortem. However, neuroimaging is useful to make differential diagnosis, and to provide more specific information on the neuropathological substrate and aetiology in dementias [17].

VD was the commonest type of dementias followed by AD. Other frequent types of dementia were mixed dementia and normal pressure hydrocephalus. Most case of dementia remained unspecified. AD represents the leading type of dementia in developed countries [16]. This is not always the case in SSA, where VD was found in 48.7% of patients with dementia in the review of Olayinka and Mbuyi [18]. This is consistent with the high frequency of cardiovascular risk factors found as comorbidities among patients with dementias. A high percentage of hypertension (55.3%) was also observed in patients with dementia by Touré *et al.*, in Senegal [19]. This percentage of hypertension (58.6%) has increased in a more recent study on elder patients with dementia in Senegal [20]. The high frequency of unspecified type of dementia could be explained by insufficient diagnosis tools at that time.

Motor neuron diseases

The hospital-based prevalence of MNDs was 0.04% or 0.4 per 1000 people in our study. In Africa, the prevalence of MNDs ranged from 250 to 750 per 100000 in hospital-based studies and ranged from 5 to 15 per 100000 people in community-based studies [21]. Amyotrophic lateral sclerosis (ALS) was found in 39.1% of MNDs (hospital-based prevalence of 0.02% or 0.2 per 1000 people). This prevalence is similar to the findings of Lekoubou *et al.*, who reported a hospital-based prevalence varied from 0.2 to 0.8 per 1000 people in SSA [5]. ALS is the most frequent MNDs worldwide [22]. The predominance of male found in our study is consistent with the finding of studies conducted in Africa [23, 24]. The mean age of our patients was 45.7 years with extremes between 16 to 70 years. Even if there is no current explanation, in Africa, ALS patients present symptoms at younger age than western country [22, 23].

Electrophysiological and biological assessments were

more frequently performed in the MND group. Electrodiagnostic is the corner stone for the diagnosis of ALS and MND [25]. Biology and neuroimaging are useful for aetiology and differential diagnosis. The diagnostic delay would be related to the cost, the inaccessibility of additional examinations and the lack of qualified personnel.

Smoking and hypertension were the comorbidities associated to MNDs. Imam and Ogunniyi also found smoking and hypertension in MNDs patients in Nigeria [24].

Chorea

Chorea was the less common NDs. The hospital-based prevalence when considering the case of chorea associated to dementia was 0.03% or 0.3 per 1000 people in our study. In a study conducted in Egypt, the prevalence was 0.62 per 1000 for rheumatic chorea, 0.21 per 1000 for HD, 0.17 per 1000 for atherosclerotic type chorea and 0.12 per 1000 for encephalitic type chorea [26]. Sydenham chorea, Huntington's disease (HD) and kernicterus were the clinical pattern found in our study. As found in our study, Sydenham chorea is the commonest form of acquired chorea [27]. There is male predominance in our study. This consistent with the studies done on HD and Sydenham chorea [5, 27]. The mean age at diagnosis was 48.2 years (ranged from 8 to 78). In HD, age ranged from less than 9 to 80 years and while Sydenham chorea affects usually children and adolescents [5, 27]. Kernicterus represented sequelae of neonatal jaundice which has not been well managed.

5. Study Limitations

This hospital-based retrospective was conducted using medical files of patients. These files sometimes missed information which might be helpful to characterized NDs. There were no specifications on the clinical screening tools or criteria used for the diagnosis of NDs. In addition, few accurate diagnostic tools were available in Cameroun such as MRI, electrodiagnostic and genetic screening. MRI was available only in Douala General Hospital and the cost was not affordable by most of our patients.

6. Conclusion

At the end of this study, neurodegenerative disorders are existing in our environment. The number of people affected is growing over the years. The hospital-based prevalence found is close to several hospital-based studies. PD and VD were the leading types of Parkinsonism and dementia as reported in many developing countries. However, many aetiologies remained unspecified. A prospective and community-based study will be helpful in determining extent of NDs in the population.

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Conflict of Interest

The authors declare that they have no competing interests.

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