



Prevalence of the major neurological disorders in a semi-urban community in northern Benin



Thierry Adoukonou^{a,b,*}, Laurine Adogblé^b, Mendinatou Agbétou^{a,b}, Dieu donné Gnonlonfoun^c, Dismand Houinato^c, Edgard-Marius Ouendo^d

^a Department of Neurology, University of Parakou, Benin

^b Clinic of Neurology, University Teaching Hospital of Parakou, Benin

^c Department of Neurology, University of Abomey-Calavi, Benin

^d Regional Institute of Public Health, University of Abomey-Calavi, Benin

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ABSTRACT

Background: Neurological disorders are some of the most disabling diseases. Epidemiological data on their incidence in Benin are scarce.

Objective: The prevalence of major neurological diseases among people older than 15 years was investigated in Titirou.

Methods: It was a cross-sectional study and door-to-door survey which took place from June 10 to August 30, 2014, in the district of Titirou and included 1094 persons. The diagnosis of migraine, tension-type headaches, epilepsy, peripheral neuropathies, stroke, parkinsonism, Parkinson's disease and dementia were conducted using a validated screening questionnaire, neurological examination and standard diagnostics criteria.

Results: They were aged from 16 to 85 with a mean age of 29.8 + / - 12.9 years. Forty five percent (492/1094) were males. Among the 1094 respondents, 497 (45.4% 95%CI 42.5–48.4) had at least one neurological disorder. The raw prevalences of the conditions were: tension-type headaches (26.9%), migraine (14.3%); peripheral neuropathies (5.6%); epilepsy (1.9%); stroke (1.3%), parkinsonism (0.1%). No case of dementia or Parkinson's disease was found. Socio-demographic factors associated with these conditions were as follows: tension-type headaches: age ($p = .020$); peripheral neuropathies: age ($p = 0.000$); sex ($p = .006$); profession ($p = .004$); marital status ($p = .032$); and level of education ($p = .003$); stroke: age ($p = .000$) and marital status ($p = .000$).

Conclusion: These results point to a high prevalence of neurological disorders in Titirou

1. Introduction

According to the World Health Organization more than one billion people in the world live with neurological disorders [1]. The Global Burden of Diseases (GBD) estimated that neurological disorders were the most disabling diseases in the world and the second cause of death and accounted for 16.8% of all deaths [2]. It can be explained by the increase in neurodegenerative disease due to extended life expectancy. The burden of neurological disorders is higher in developing countries due to several factors such as the lack of specialists and health care facilities. In Africa, there are numerous reports on the prevalence of neurological disorders in the community. In Uganda, a 3.3% prevalence was reported for neurological diseases [3] and another study in Tanzania reported 15.6% of neurological disorders [4]. The prevalence of neurological diseases in Africa has been the subject of several studies

[5–7]. For these studies, various screening tools were used, which may account for the differences in reported prevalences. These findings indicate the difficulties in conducting epidemiological surveys in this area [8]. For health care policy, the burden of disease in the community needs to be known. In Benin, epidemiological surveys have been conducted on epilepsy [9], headache [10] and stroke [11] but no epidemiological study involved all neurological diseases in the community. We aimed to assess the prevalence of neurological diseases in a semi-rural community in northern Benin.

2. Methods

2.1. Study design

It was a cross-sectional study which was carried out from 10 June to

* Corresponding author at: Department of Neurology, University of Parakou; P.O.Box 03 BP10, Parakou, Benin.

E-mail address: adoukonouthierry@yahoo.fr (T. Adoukonou).

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30 August 2014 in Parakou using a door-door survey.

2.2. Setting

Parakou is the large city in northern Benin, 425 Km from Cotonou. It comprises three districts with a total of 255,478 inhabitants [12]. It has two main hospital centres. In the University Hospital there is one neurologic clinic with two neurologists. Some facilities are available such as two CT-scan units, one electroencephalogram (EEG) and laboratory test facilities. The study took place at Titirou, which is located in the second district of Parakou. Its population was 14,075 inhabitants (estimation in 2014) with 7856 aged 15 years and over. It is subdivided into seven sub-districts.

2.3. Participants

2.3.1. Inclusion criteria

All people (older than 15 years) with residency in Titirou and present on the date of the survey having given consent orally.

2.4. Sampling

2.4.1. Sample size

The estimated sample size was 908 considering an expected prevalence of 8.03% [5] assuming a 5% risk of first species and a precision for our results of 0.025.

2.4.2. Sampling

The size was divided proportionally to the size of each subdivision (number of persons older than 15 years) in Titirou. In each subdivision, the investigators at the center had randomly determined one neighborhood. All people meeting the inclusion criteria and living in households in this neighborhood were interviewed up to the expected number. When this number was not reached, they returned to the center and repeated the operation for another neighborhood until the required number was attained. The number of participants from each subdivision is summarized in Table 1.

3. Variables

3.1. Outcome variable

The outcome variable was neurological disorders. Specifically it included the main neurological disorders such as epilepsy, stroke, headache (migraine and tension-type headache), dementia, peripheral neuropathy, parkinsonism and Parkinson's disease.

For the diagnosis we used the following criteria:

- For headaches (migraine and tension-type headache) we used the International Headache Society criteria 2004 [13]
- Epilepsy: any subject with unprovoked seizures or with this diagnosis and followed up by the neurologist or screened by the

investigation questionnaire

- Peripheral neuropathy: any subject with suggestive symptoms such as paresthesia (tingling, numbness, burning...) electrical discharge, neuropathic pain, paraparesia, sensory loss (hypoesthesia) and hyporeflexia (Achilles tendon reflex)
- Stroke was defined according the WHO definition as "rapidly developing signs of focal (or global) disturbance of cerebral function, leading to death or lasting longer than 24 h, with no apparent cause other than vascular [14].
- Dementia: all subjects who had one response for the items of dementia in the investigation questionnaire [15].
- Parkinsonism: any subject with akineto- hypertonic syndrome and/or resting tremor and nasal-palpebral reflex inexhaustible
- Parkinson's disease: any subject with parkinsonism without vascular disorder, use of neuroleptics, no brain infection or any intoxication.

3.2. Exposure variables

The exposure variables were age, sex, marital status, ethnicity, level of education, religion and occupation.

3.3. Data collection

The data were collected by survey using the questionnaire developed by Bower et al. in 2007 for screening for neurological conditions [15]. It contained 24 items which explored the main neurological diseases. The questionnaire initially written in English had been translated into French by ourselves. This French version was retranslated by another translator who was not familiar with the initial version of the text in English (back translation). This tool had a good sensitivity (100%) and specificity (61.0%) for the diagnosis of the main neurological diseases in a resource-poor setting. This new English version was compared to the original English version and the differences were corrected. The data were collected by two physicians who were trained in neurological examinations. In each house, physicians selected all subjects older than 15 years. Each selected person was examined by the physician (interview to record his past medical history for neurological symptoms and neurological examination) in strict respect of privacy and confidentiality. All screened people for neurological diseases were examined by the specialists in the University hospital.

3.4. Statistical analysis

The data were analyzed using Epi-Info 7.1.1.4 software (Inc. Texas). All categorical variables were expressed as percentages and the quantitative variables by means and standard deviation when the distribution was normal and the median and interquartile interval when the distribution was abnormal. The prevalence of each neurological disease was estimated by dividing the number of people with this disorder by the number of interviewees. The prevalence and its 95% confidence interval were estimated. Confidence intervals were calculated using the Poisson distribution method given the rarity of some neurological diseases. The direct standardization method was used to estimate the standardized-prevalence of stroke as well since its prevalence increased with age. The chi-2 test or Exact Fisher test were used to compare percentages and a *p*-value below 0.05 was considered as significant.

4. Ethical considerations

Formal authorization of the local authorities was obtained before the survey. The approval of the Local Ethical Committee of Biomedical Research of the University of Parakou was obtained. Each participant gave oral consent before inclusion. The confidentiality of the data was guaranteed. After the diagnosis each subject received treatment and was followed up by the neurologists

Table 1

The number of people included in each subdivision in Titirou, Parakou.

Name of the subdivision	Population (inhabitants)	Number expected	Number in the Survey
Borarou	290	35	42
Dama N'Kparou	184	22	30
Gounin	533	64	80
Mondouro	338	40	52
Titirou centre	5394	645	760
Tobou N'Kparou	322	39	50
Toukossari	526	63	80
TOTAL	7587	908	1094

Table 2
sociodemographic data for neurological diseases in Parakou in 2014.

Variables	Sample	Tension-Type Headache	p	Migraine	p	Epilepsy	p	Peripheral Neuropathy	p	Stroke	p
Sex	492 (45.0)	133 (27.0)	0.915	61 (12.4)	0.111	8 (1.6)	0.522	17 (3,5)	0.006	6 (1.2)	0.873
Male	602 (55.0)	161 (26.7)		95 (15.8)		13 (2.2)		44 (7,3)		8 (1.3)	
Female											
Age (years)			0.020		0.129		0.075		0.000		0.000
< 40	882 (80.6)	240 (27.2)		135 (15.3)		17 (1.9)		34 (3.9)		5 (0.6)	
40–59	158 (14.4)	48 (30.4)		16 (10.1)		1 (0.6)		18 (11.4)		6 (3.8)	
60 and older	54 (5.0)	6 (11.1)		5 (9.3)		3 (5.6)		9 (16.7)		3 (5.6)	
Level of instruction			0.933		0.364		0.219		0.003		0.267
No schooling	186 (17.0)	52 (28.0)		21 (11.3)		7 (3.8)		20 (10.8)		4 (2.2)	
Primary	223 (20.4)	61 (27.4)		28 (12.6)		3 (1.3)		15 (6.7)		4 (1.8)	
Secondary	505 (46.2)	131 (25.9)		81 (16.0)		9 (1.8)		19 (3.8)		6 (1.2)	
Higher	180 (16.4)	50 (27.8)		26 (14.4)		2 (1.1)		7 (3.9)		0 (0.0)	
Occupations			0.673		0.304		0.746		0.004		0.201
Students	383 (35.0)	110 (28.7)		71 (18.5)		7 (1.8)		15 (3.9)		1 (0.3)	
Traders	204 (18.6)	56 (27.5)		26 (12.7)		6 (2.9)		23 (11.3)		4 (2.0)	
Craftsman	194 (17.7)	141 (72.7)		24 (12.4)		3 (1.5)		8 (4.1)		2 (1.0)	
Drivers	33 (3.0)	8 (24.2)		3 (9.1)		0 (0.0)		1 (3.0)		0 (0.0)	
Formal	117 (10.7)	27 (23.1)		14 (12.0)		3 (2.6)		3 (2.6)		4 (3.4)	
Housewives	97 (8.9)	29 (29.9)		11(11.3)		0 (0.0)		7 (7.2)		1 (1.0)	
Retired	22 (2,0)	4 (18.2)		2 (9.1)		1 (4.5)		3 (13.6)		1 (4.5)	
Other	44 (4.1)	7 (15.9)		5 (11.4)		1 (2.3)		1 (2.3)		1 (2.3)	
Marital status			0.871		0.093		0.298		0.032		0.000
In couple	563 (51.5)	151 (26.8)		67 (11.9)		10 (1.8)		41 (7.3)		9 (1.6)	
Single	522 (47.7)	140 (26.8)		87 (16.7)		10 (1.9)		20 (3.8) (0.0)		5 (1.0)	
Other	9 (0.8)	3 (33.3)		3 (33.3)		1 (11.1)		0		0 (0.0)	

5. Results

During the survey 1094 people were examined, of whom 492 (45.0%) were males with a sex-ratio of 0.8. Their ages ranged from 16 to 85 years with a mean of 29.8 ± 12.9 years. The most common ethnicities were Nagot (39.8%), Fon (15.9%) and Bariba (14.2%), with Christians (55.8%) and Muslims (43.5%). Most of the people were married. Only 17.0% had no education. The majority were students (35.0%). Their sociodemographic characteristics are summarized in the second column in [Table 2](#).

After the neurological examination 497 had at least one neurological disease with a prevalence of 45.4% (95%CI: 42.5–48.4).

Among the 1094 people:

- 294 had tension-type headache with a prevalence of 26.9% (95%CI: 24.3–29.6)
- 156 were diagnosed as migraine with a prevalence of 14.3% (95%CI: 12.3–16.4)
- 61 had peripheral neuropathy with a prevalence of 5.6% (95%CI: 4.3–7.1)
- 21 had epilepsy with a prevalence of 1.9% (95%CI: 1.2–2.9)
- 14 were diagnosed as stroke with a prevalence of 1.3% (95% CI: 0.7–2.1)
- 1 person had a parkinsonism due to neuroleptics use with a prevalence of 0.1% (95%CI:0.04–0.45)

No person had dementia or Parkinson's disease.

After adjusting to the WHO type population by using direct standardization, the standardized prevalence of stroke was 1938 per 100,000 persons.

No sociodemographic characteristics were associated with epilepsy or migraine. Tension-type headache was significantly more prevalent in people aged between 40 and 59 years. Stroke was significantly associated with age and marital status. All sociodemographic characteristics were associated with peripheral neuropathy. These findings are summarized in [Table 2](#).

6. Discussion

This study, conducted in Titirou, a rural community in northern Benin, estimated the overall prevalence of neurological diseases at 45.4%. More specifically, the prevalence of tension headaches was 26.9%; migraine 14.3%; peripheral neuropathies 5.6%; 1.9 epilepsy; 1.3% and 0.1% stroke for neuroleptic-induced Parkinson's.

Our prevalence of neurological diseases (45.4%) was significantly higher than El Tallawy et al.'s study in 2011 in Egypt, which had a prevalence of 4.6% [16]. The study in Egypt included all the inhabitants living for at least 6 months in the locality chosen for the study, whereas we included only the subjects aged at least 15 years. Moreover, Egypt's health system is better than ours. The prevalence of neurological disorders in our study is high compared to reports in Egypt, Uganda and Tanzania. However, it is close to that reported by Longe and Osuntokun in Nigeria in the rural community of Udo (47%) [5]. Headache was not included in the Egyptian study, while in Uganda and Tanzania only chronic headaches were included. In the Ugandan study, 45.1% of participants had more than one neurological symptom. The prevalence of headache is high in our study (41.2%). By subtracting them from the other neurological disorders the prevalence was comparable to that reported in Egypt, Uganda and Tanzania. Furthermore, the neurological conditions observed in our study were dominated by headache with the highest prevalence (41.2%). This is indeed the first reason for neurology consultations in Benin [10]. The prevalence of migraine was 14.3%. This result is similar to those found in a previous in 2011 [17] and in 2017 [18] in Parakou. We found a prevalence of migraine of 14.2% and 14.4%. By contrast, in Colombia, in 2004, Diaz-Cabezas et al. reported a 27.8% prevalence of migraine [19]. This difference could be explained by the confirmation method of migraine. In the Colombian study, the authors used the Colombian version of the neuroepidemiological protocol for neurological diseases devised by the WHO, whereas we used the 2004 IHS criteria which seems more reliable.

The prevalence of peripheral neuropathies was 5.6%. Low back pain was included in our study because this peripheral neuropathy is currently a public health problem in our region with the common use of two-wheeled vehicles. Adjien et al. in 2016 found a prevalence of 18.6% of lombosciatics in outpatient neurology at CNHU-HKM Cotonou

[20]. Dewhurst et al. found a lower prevalence of 3.76% [21], as did Kruja et al. who also noted a prevalence of (3.25%) [22]. This high prevalence in our study is due to the fact that unlike the other studies, we included lombosciatics. The prevalence of peripheral neuropathies increased significantly with age. These results confirm those of Adjien et al. who found in 2007 in Cotonou, that the prevalence of peripheral neuropathies was multiplied by 2.5 over 40 years [23]. In Australia, Cherry and Affandi also found that age over 40 years was a risk factor for peripheral neuropathies [24]. As age increases, vascular and osteoarthritic diseases increase, and are responsible for the occurrence of peripheral neuropathies. The fact also that uneducated people were more at risk of developing peripheral neuropathy in our study may be due to the fact that they usually do not consult early enough. We know that many causes of peripheral neuropathies are not reported in our area because of the lack of diagnostic facilities.

We reported a prevalence of stroke of 1.3%. Similar results were found by Kruja et al. [22] and Diaz-Cabezas et al. [19] who reported a prevalence of 1.24% and 1.0% respectively. The prevalence of stroke increased significantly with age. It is recognized that advanced age is primarily a vascular risk factor because of physiological arterial aging but also arterial hypertension, which in turn increases the risk of stroke four to seven fold.

The strengths of our study lie in several elements. It was a door-to-door survey, the first to look at neurological conditions in the general population in Parakou in northern Benin and the sample size is large. The minimum expected size (908 subjects) was exceeded during the survey (1094 subjects). Sampling was done in such a way that the sample was representative of the study district. We randomly drew half of the neighborhoods in the borough. Based on the demographic weight of each selected neighborhood, a sample size per village was calculated. This size was reached each time during the investigation phase. In addition, the screening phase was based on a WHO validated questionnaire and that of confirmation was conducted by a neurologist based on standardized tools and procedures, which increases the diagnostic accuracy of the cases.

Nevertheless, this observational study could be affected by information bias. Indeed, age was self-reported, and in a semi-rural environment with a high illiteracy rate, subjects do not report their ages accurately. Nevertheless, to limit this effect, we asked the subjects for their national identity card, voter's card or birth certificate, which was provided if available. Similarly, subjective signs such as pain, paresthesia, also self-report item, may have been exaggerated or minimized, although the clinical examination was designed to limit this type of bias.

7. Conclusion

This is the first survey on neurological disorders in Benin and showed a high prevalence of neurological disorders in the community. This demonstrated the high burden of these disorders in Benin, which needs urgent action to study its determinants in order to foster prevention.

Credit author statement

We have no credit statement.

Declaration of Competing Interest

All authors declare no conflict of interest.

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