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Knowledge of Stroke among an Urban Population in Cotonou (Benin)

Marie-Joëlle Cossi[a] Pierre-Marie Preux[a] Hugues Chabriat[b] Claire Gobron[c]
Dismand Houinato[a, d]

[a]INSERM U1094, Tropical Neuroepidemiology, University of Limoges, School of Medicine, Institute of Neuroepidemioloy and Tropical Neurology, and CHU, Limoges, [b]Department of Neurology, Lariboisière Hospital, University of Paris VII Denis Diderot, and [c]Service de physiologie-explorations fonctionnelles, Hôpital Lariboisière, Paris, France; [d]Department of Neurology, CNHU, Cotonou, Benin

Key Words
Stroke · Sub-Saharan Africa · Urban population

Abstract
Background: Studies on the knowledge of stroke, its related risk factors and warning symptoms in the populations of Sub-Saharan Africa are scarce. No study has been performed in Benin until now. ***Methods:*** A door-to-door survey was performed in two districts of Cotonou with a broad socioeconomic range. 15,155 individuals aged ≥15 years were interviewed using a semi-structured questionnaire adapted from previous reports. ***Results:*** 15,155 individuals consented to participate in the survey. 14.1% correctly identified the brain as the affected organ in stroke. The most commonly identified risk factor was hypertension (34.5%). The most often cited warning signs of stroke were paralysis and hemiplegia (34.4%). Relatives were the major source of information about stroke (25.1%). In multivariate analysis, age, education level, occupation, self-reported risk factors of stroke, overweight and obesity were associated with at least one correct response to the questionnaire about stroke risk factors or symptoms. ***Conclusion:*** The awareness of stroke, and its risk factors and symptoms is low in Cotonou. The results suggest that specific education programs may improve people's knowledge of stroke and their awareness of related risk factors in Sub-Saharan African countries.

Introduction

The Global Burden of Disease Study estimated that there were 16 million new stroke cases and 5.7 million stroke deaths in 2005 worldwide. In the absence of significant changes, it is predicted that there will be 18 million new cases and 6.5 million deaths in 2015, and that in 2030 there will be 23 million stroke cases and 7.8 million related deaths [1].

Stroke is a major cause of morbidity and mortality in developing countries, where cardiovascular risk factors are increasing due to the adoption of a western lifestyle with a high consumption of calorific foods as well as a reduction in physical activity [2, 3].

In Sub-Saharan countries as Benin, specific therapeutic tools, such as stroke care units or the use of intrave-

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Prof. Pierre-Marie Preux
Institute of Neuroepidemiology and Tropical Neurology (Inserm U1094)
Faculty of Medicine, 2, rue du Docteur Marcland
FR–87025 Limoges (France)
Tel. +33 55 543 5820, E-Mail preux@unilim.fr

nous tissue plasminogen activator, are not available. The only way to decrease the burden of stroke is to reduce the number of cases at risk. Implementing primary and secondary prevention measures at the individual and population level is of paramount importance. The individual approach needs to identify people at high risk of stroke in order to change their risk profile by treatments or by reducing risky behaviors. The population approach needs either mass screening or education campaigns to alter the most frequent risky behaviors at the population level. This requires a sufficient knowledge of stroke, and of its risk factors and warning signs in the population.

As the knowledge of stroke risk factors and warning signs has not been previously evaluated in a large community in Sub-Saharan Africa, the objective of the present study was to perform such an investigation in the population of Cotonou in Benin.

Material and Methods

Study Framework

The study was carried out between September 15 and October 2, 2008, in Cotonou, the economic capital of Benin. Cotonou consists of one single township of 13 boroughs and 140 districts. The first and second boroughs, where the study took place, are composed of 21 districts and were chosen for their social mix, which is very characteristic of Cotonou.

In 2002, 665,100 inhabitants were counted in Cotonou and there were 94.5 men for every 100 women. The population of the town (total area over 79 km^2) represents 9.8% of the country's population (8,419 inhabitants per square kilometer). The population of the first and second boroughs is 109,149 residents, including 55,939 women. The population of the two boroughs totals 69,869 residents aged 15 and over. Cotonou's ethnic majorities are Fons (32.9%) and Gouns (15.2%) [4].

The study was descriptive and analytic and concerned a sample of 15,155 subjects aged 15 years and over. The estimated sample size was 14,969 subjects. It was calculated with Nquery Advisor 7.0 (Statistical Solutions, Saugus, Mass., USA) considering a stroke prevalence of 0.25% [5] for the study area and a precision of 0.08%. All individuals living in a district of the two boroughs at the time of the survey were included in the survey. All those working but not living in the study area were excluded. The sample was divided up throughout the zone's neighborhoods in proportion to each zone's size. To recruit the participants, the investigators went from door to door in each area. They worked from the area's center in a random direction, visited every family and every house in their chosen direction. Whenever the predicted number of individuals in the area was not reached, the investigators started again from the center and repeated the procedure in another direction.

All participants signed an informed consent form (finger prints were used in illiterate subjects after detailed oral explanations). The study was approved by Benin's National Ethics Committee.

The data of this study were collected at the same time as those of a study on the prevalence of stroke in Cotonou [6]. Both studies share the study population and the inclusion and exclusion criteria.

Data Collection

The survey was a cross-sectional, community door-to-door study, carried out using a semi-structured questionnaire. The tool was adapted from previous studies [7–9] and consisted of two parts. The first part consisted in obtaining socio-demographic information and common self-reported risk factors. The second part included items on knowledge and perceptions of stroke. Questions on knowledge of stroke, vascular risk factors, the affected organ and the main clinical manifestations were all open ended. Items dealing with the perception of stroke, the reactions to stroke symptoms and information resources were close ended.

Data Analysis

The data were entered in Epi Data and were analyzed with MODALISA version 7 (Kynos, Paris, France), and STATA version 10 (StataCorp LP, College Station, Tex., USA).

To assess knowledge of warning signs, we used keywords previously used and acknowledged by the National Institute of Neurological Disorders and Stroke (NINDS), such as 'sudden weakness or numbness of the face, arm, or leg especially on one side of the body', 'sudden confusion or difficulty in speaking or understanding speech', 'sudden visual impairment in one or both eyes', 'sudden difficulty in walking', 'dizziness, or loss of balance or coordination' and 'sudden severe headache with no known cause' [10]. To assess knowledge of risk factors, the following responses were considered as correct: 'increased age', 'male sex', 'family history of stroke', 'stress', 'heart disease', 'hypertension', 'smoking', 'harmful alcohol drinking', 'high cholesterol', 'hyperlipidemia', 'physical inactivity', 'overweight or obesity', and 'diabetes'.

Continuous variables are presented as means ± standard deviation while categorical variables were presented as proportions. The frequencies were compared using the χ^2 test and p values <0.05 were considered as statistically significant.

Multivariate logistic regressions were used to assess the predictors for at least 1 correct response for 3 different dependent set of variables: risk factors, symptoms and affected organ. Independent variables included in the model were age, sex, education, occupation, body mass index, smoking, prior stroke, family history of stroke and hypertension. Variables were eliminated in a stepwise backward fashion if they failed to reach significance ($p < 0.05$) until a final model was obtained. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were generated for all the terms in the final models.

Results

Characteristics of the Population Studied

A total of 15,155 individuals participated in the study. There were 8,862 women (58.5%). The mean age was 31.0 ± 14.1 years. The demographic details are shown in table 1.

Table 1. Characteristics of subjects included in the study (Cotonou, 2008)

Factors	Number
Sex	
Male	6,291 (41.5%)
Female	8,862 (58.5%)
Age	
15–44	12,580 (83.3%)
45–54	1,212 (8.0%)
55–64	799 (5.3%)
65–74	348 (2.3%)
75–84	134 (0.9%)
85+	30 (0.2%)
Education level	
No education	4,037 (26.7%)
Primary	4,277 (28.3%)
Secondary	5,565 (36.8%)
Secondary+	1,242 (8.2%)
Occupation	
Shopkeepers/employees, public and private	4,508 (29.8%)
Trades people/laborers/farmers	3,982 (26.4%)
No occupation	3,629 (24.0%)
Students	2,952 (19.5%)
Others	39 (0.3%)

Hypertension was observed in 18.7% of the subjects. Family cases of stroke were reported by 17.0% of participants. A proportion of 2% smoked and 0.9% were diabetic according to their doctors.

Organ Affected by Stroke

Most of the subjects were unable to name the organ affected by stroke: 22.1% did not know, 20.9% thought that the heart was responsible, 14.8% cited the limbs, 14.1% cited the brain, 11.4% cited the nerves, 5.5% cited others, 5.4% cited nothing and some respondents thought that stroke involved various organs, such as the head (3.7%) and tongue (2.2%).

In univariate analysis, sex, increased age, high level of education, smoking, overweight or obesity, and hypertension and family history of stroke, were significantly associated with awareness of the brain as the organ affected by stroke. Women provided the correct answer less often than men (table 2).

In multivariate logistic regression analysis, the same variables were found to be significant (table 3).

Risk Factors for Stroke

More than half of respondents (55.2%) were aware of stroke risk factors. Hypertension was ranked as the first risk factor by 5,063 subjects (34.5%). The other main risk factors identified by the participants included: violence, anger and irritability (11.7%), worry and stress (7.6%), diet (4.7%), and charm and poisoning (4.3%). 3,303 (21.8%) participants did not know even a single risk factor. Only 49 (0.3%) and 39 (0.3%) individuals, knew that diabetes and cardiac problems are risk factors of stroke, respectively. Obesity was reported as a risk factor by 1.0% of subjects.

Self-reported risk factors of stroke, education, age and occupation were significantly associated with the awareness of at least one risk factor of stroke in univariate analysis (table 2). Sex was not significantly related to this awareness.

In multivariate logistic regression, the same variables were found to be associated with the awareness of at least one correct risk factor of stroke, and sex was not significantly associated (table 3).

Stroke Symptoms

More than 5,000 participants (33.0%) recognized at least one stroke symptom. The most common stroke symptom, according to them, were paralysis and hemiplegia (34.4%); symptoms acknowledged by NINDS such as walking difficulties, weakness on one side, trouble in seeing or speaking, 12.8%; headaches and dizziness, 11.8%. A proportion of 27.2% were unable to cite any stroke symptom. A few specific terms in local language and their equivalents in English are listed in table 4.

In univariate analysis, family history of stroke, hypertension, overweight or obesity, level of education, occupation and age were significantly associated with knowing at least 1 stroke symptom (table 2).

The same variables were found to be significant in multivariate logistic regression analysis. Sex was not associated with knowledge of stroke symptoms (table 3).

Respondent's Reaction to Stroke Symptoms

A proportion of 94.1% of subjects reported that they would go to a hospital if one of their relatives experienced symptoms suggestive of stroke. A proportion of 15.1% thought they would call a friend for advice, 2.9% said they would use drugs, and 3.5% said they would wait and let the patient rest.

The decision of going to hospital was associated with age ($p < 0.0002$; OR 1.40; 95% CI 1.17–1.67), level of education ($p < 0.00001$, OR 1.22; 95% CI 1.13–1.31), overweight or obesity ($p < 0.0003$; OR 1.17; 95% CI 1.07–1.28), hypertension ($p = 0.0117$; OR 1.27; 95% CI 1.05–1.53) and a family history of stroke ($p < 0.00001$; OR 1.87; 95% CI 1.50–2.33).

Table 2. Univariate analysis to predict a good stroke knowledge (risk factors, symptoms and affected organ as dependent variables with at least one correct answer) (Cotonou, 2008)

Factors	Affected organ		Risk factors		Symptoms	
	OR	95% CI	OR	95% CI	OR	95% CI
Sex						
Male	ref.	–	ref.	–	ref.	–
Female	0.64	0.59–0.69	–	–	–	–
Age						
15–40 years	ref.		ref.		ref.	
>40 years	1.15	1.05–1.27	1.53	1.42–1.66	1.39	1.28–1.50
Profession						
Shopkeepers/employees, public or private	ref.	–	ref.	–	ref.	–
Trades people/laborers/farmers/fishermen	0.75	0.68–0.84	0.75	0.68–0.81	0.77	0.70–0.84
No occupation	0.74	0.66–0.83	0.81	0.74–0.88	0.83	0.75–0.91
Students	–	–	0.67	0.61–0.74	0.84	0.76–0.93
Others	–	–	–	–	–	–
Education						
No education	ref.	–	ref.	–	ref.	–
Primary	1.26	1.12–1.42	1.19	1.09–1.30	–	–
Secondary	1.57	1.41–1.76	1.23	1.13–1.33	–	–
Secondary +	2.97	2.57–3.44	2.33	2.03–2.66	1.44	1.26–1.64
Smoking						
No	ref.	–	ref.	–	ref.	–
Yes	1.70	1.33–2.18	–	–	–	–
BMI						
Thin	ref.	–	ref.	–	ref.	–
Normal	1.42	1.15–1.76	1.31	1.13–1.51	–	–
Overweight	1.89	1.52–2.36	1.78	1.52–2.09	1.54	1.30–1.83
Obese	1.41	1.11–1.79	2.11	1.77–2.50	1.45	1.21–1.74
Family history of stroke						
No	ref.	–	ref.	–	ref.	–
Yes	2.13	1.94–2.35	1.46	1.34–1.59	1.96	1.80–2.14
Hypertension						
No	ref.	–	ref.	–	ref.	–
Yes	1.24	1.12–1.37	1.43	1.31–1.55	1.32	1.21–1.44

Only significant variables are shown.

Source of Information

A proportion of 25.1% had heard about stroke from their relatives; 13.9% on television, radio and the Internet; 11.7% from rumors; 9.5% at school and their general culture; 11.8% had received information on stroke from doctors and 20.4% did not have a specific source of information or could not recall.

Discussion

Paralysis is the symptom most often identified by respondents in most of the studies carried out worldwide. Though the frequencies are not the same when compared to our survey, the rank of this answer is similar to that reported in a Nigerian study, where paralysis was reported by 55.6% of respondents [11]. It is also comparable to the results of an Indian study where paralysis of one side of the body ranks first for 62.2% individuals [12]. Respondents from Europe and America cited other signs, such as aphasia, facial palsy, headache, difficulty in speaking or understanding, blurred and double vision, slurred speech and weakness, more often than Africans [13–15]. Furthermore weakness is the symptom most associated with increased calls for Emergency Medical Services in those countries [16]. The reason for these differences is possibly that the dominant presentation with weakness on one side of the body has overshadowed other forms of

Table 3. Multivariate logistic regression involving characteristic data as independent variables to predict stroke knowledge (dependent variable) (Cotonou, 2008)

Factors	Organ affected		Risk factor		Symptoms	
	OR	CI 95%	OR	CI 95%	OR	CI 95%
Sex						
Male	ref.	–	ref.	–	ref.	–
Female	0.69	0.63–0.76	–	–	–	–
Age						
15–40 years	ref.	–	ref.	–	ref.	–
>40 years	–	–	1.36	1.24–1.49	1.25	1.14–1.38
Profession						
Shopkeepers/employees, public or private	ref.	–	ref.	–	ref.	–
Trades people/laborers/farmers/fishermen	0.79	0.70–0.89	0.90	0.82–0.99	0.88	0.80–0.97
No occupation	0.88	0.79–0.99	0.89	0.82–0.98	0.88	0.80–0.97
Students	–	–	0.66	0.59–0.73	–	–
Others	–	–	–	–	–	–
Education						
No education	ref.	–	ref.	–	ref.	–
Primary	1.19	1.05–1.34	1.27	1.16–1.39	–	–
Secondary	1.42	1.25–1.61	1.59	1.45–1.75	1.13	1.02–1.24
Secondary +	2.31	1.96–2.73	2.93	2.52–3.40	1.41	1.22–1.63
Smoking						
No	ref.	–	ref.	–	ref.	–
Yes	1.41	1.09–1.83	–	–	–	–
BMI						
Thin	ref.	–	ref.	–	ref.	–
Normal	1.41	1.14–1.75	1.24	1.07-1.45	–	–
Overweight	1.92	1.53–2.42	1.54	1.31–1.82	1.43	1.20–1.71
Obese	1.52	1.19–1.95	1.74	1.46–2.08	1.29	1.07–1.57
Family history of stroke						
No	ref.	–	ref.	–	ref.	–
Yes	2.00	1.81–2.20	1.31	1.20–1.43	1.84	1.68–2.01
Hypertension						
No	ref.	–	ref.	–	ref.	–
Yes	1.15	1.03–1.28	1.18	1.08–1.30	1.13	1.03–1.24

Table 4. List of specific terms in local language (Fon) and equivalents in English (Cotonou, 2008)

Symptoms of stroke	
Specific terms in local language (Fon)	Equivalents in English
Afo Kou, Awa kou, Nou gèkin; E Kplibo	Paralysis
Nou gèkin	Mouth deviation
Noukounmè gba azin	Vertigo
Ta fin fin	Headache
Gbé fan	Troubles in speaking
Noukou do zinflou	Troubles in seeing

presentations of the disease in West Africa. Indeed, in Benin, stroke is simply described as paralysis of the limbs on one side of the body [17].

Results concerning risk factors of stroke are consistent with studies conducted using open-ended questions in other countries in that hypertension gained the first place among all the risk factors enumerated. In a Brazilian study, hypertension was cited by 42.0% of the public [18] versus 24.0%, [19] 20.0% [20] and 51.0% [21] of respondents in India, UK and the USA, respectively. All this is in accordance with a multivariate model which demonstrated that hypertension was one of the most important risk factors for stroke [22]. In contrast with our survey, smoking is the most common risk factor mentioned in some studies from westernized countries.

This was explained by national campaigns focusing on smoking and delivering the message of an increased risk for cardiovascular diseases [23, 24]. The proportion of respondents who had positive answers for other risk factors, such as diabetes, smoking and high cholesterol, was much lower as compared with other studies from developed countries. These results reflect the level of education of the population (only 8.2% had more than a secondary-level education), and smoking is not as frequent as in developed countries. The prevalence of smoking in the general population in Cotonou is 2.9% [25] against rates ranging from 8.0 to 27.3% for African countries [26].

Even if the response rate seems low due to the type of questions (open ended) and the use of free recall by the participants, the results on risk factors and warning signs are consistent with those from other studies. Jones et al. [27] showed that the ability to name one or more risk factors for stroke differed between studies and ranged from 18 to 94% when open-ended questions were used. Recognition of stroke symptoms was also poor when open-ended questions were used and the ability to name one symptom varied significantly between studies and ranged from 25 to 100%.

In univariate or multivariate analyses, the level of stroke knowledge was frequently associated with age, education, occupation, and self-reported risk factors of stroke. The positive relationship between stroke knowledge and higher education is already well established [8, 23, 28, 29]. However, there are differences regarding age. Some studies reported a better knowledge among elderly people, whereas others showed improved knowledge among young people. But most studies reported a better knowledge among older participants [30]. Surprisingly, sex was only correlated with the organ affected by stroke in our survey. So far, little has been reported on gender differences in stroke knowledge except for one study from Germany, where data indicate that stroke knowledge and risk awareness differ between genders [31].

There is a lack of awareness about stroke among the general population of Cotonou since the results indicate that most participants could not explain the mechanism leading to stroke and ignored the organ affected in stroke, and the symptoms and risk factors of stroke. Even if there is great variation in the methodology of the studies, particularly in terms of the size of the population being studied and the type of questions (open-ended or close-ended), the same lack of awareness exists in other developing countries [32], and even in developed countries like the USA and Australia [23, 33, 34].

This study was an open-ended survey based on a large number of respondents. The sample size provides adequate power and we tried to assess the respondent's knowledge as honestly as possible. However, the study may also be biased due to the qualitative analysis and coding process that sometimes may not correctly convey the answer.

Conclusion

The results suggest that hypertension is the best-known risk factor and that stroke symptoms are not known. Only few subjects were aware of tobacco smoking and diabetes mellitus as risk factors for stroke. This information appears useful for planning information and stroke prevention campaigns. Based on our respondents' specified sources of information on stroke, educational efforts are possible in the mass media and should be used to encourage general practitioners to educate their patients, especially those at increased risk.

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Disclosure Statement

None.

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