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Short Term (3 Months) Prognosis of Stroke in Parakou

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Abstract

Background: The burden of stroke is very high in sub-Saharan Africa. The identification of the factors influencing poor outcome can help to reduce this burden. **Objective:** To study factors influencing the prognosis of stroke at Parakou. **Methods:** It was a prospective study conducted over two periods: inclusion period between 1st January and 30 June 2013; monitoring period of survivors between 1st July and 30 September. All consecutive patients admitted in the hospitals for stroke in the study period were included. The functional outcomes were assessed by the RANKIN scale (RANKIN > 2). Epi-info version 7 and SPSS version 16 were used for the statistical analyses. **Results:** We recruited 85 patients; mean age was 52 ± 15 years. The housewives and the unschooled represented respectively 33% and 65%. The mortality rates at 1 and 3 month were respectively 27% and 32%. Factors associated with mortality were female gender, stroke severity, disorders of consciousness, hyperthermia and hyperglycemia at admission, overweight, pneumonia, anemia, hyperleucocytosis, higher total and LDL serum cholesterol levels at 1 month; housewife status and pneumonia were associated at 3 month. 47% of survivors were independent at 1 month. Stroke severity and length of hospital stay were associated with disability at 1 month whereas previous stroke and disability history, stroke severity, weight and length of hospital stay were related with 3 month poor functional outcome. **Conclusion**: This study showed the poor outcome of stroke patients in Parakou which were influenced by many factors. Taking account of these factors in the strategies of care in the acute phase may improve the prognosis of stroke patients.

Keywords

Mortality, Prognosis, Stroke, Parakou

1. Introduction

Stroke is the second leading cause of mortality after coronary heart disease and a major cause of disability in the world [1]. Projections for the next decades show that its overall mortality will exceed that of communicable diseases in Developing countries [2] [3]. In Europe, the incidence varies from 63 to 239.3 per 100,000 inhabitants [4]. Every year about 150,000 new cases occur in France, of which a quarter affect patients with a history of stroke [5]. In Africa, most studies are hospital-based except for a few studies in the general population, which generally report an estimated prevalence of about 300 cases per 100,000 population [6]. In Southern Africa, in the rural district of Agincourt, the authors of Southern Africa stroke Prevention Initiative (SASPI) reported 103 cases, *i.e.* a gross prevalence of 243 per 100,000 population [7] compared to 200 per 100,000 population in Tanzania [8]. In Nigeria, a prevalence of 114 per 100,000 population was recently reported in a port-type study To-door in an urban community [9]. In Benin, a study carried out in the general population in Cotonou commune in 2010 found a prevalence of 462 per 100,000 inhabitants [10]. At the University Teaching Hospital-HKM in Cotonou in 2006 a mortality rate of 50% was noted at 9 months [11]. Moreover, it was demonstrated in another study carried out in the same hospital center that in 78% of the cases the strokes led to a functional handicap [12]. Stroke will represent a major public health in Africa due to their frequency, mortality, cost and physical and cognitive impairment. The increase in cardiovascular disease in general can be explained by the change in lifestyle accompanied by intensive urbanization. This results in the emergence of major risk factors such as high blood pressure, diabetes, and dyslipidemia. As cardiovascular diseases progress, they lead to an increase in the number of strokes. The sequelae observed in survivors lead to severe disability, making the daily life of patients difficult. In Benin, the study conducted at the University Teaching Hospital-HKM in Cotonou in 2006 [11] revealed that the poor prognostic factors were coma, persistent hyperthermia, uncontrolled blood pressure and massive deficit. The bad functioning was linked to age and dependence. But no study has yet been conducted in the northern part of our country on the prognosis of stroke, hence the interest of our work whose objectives are to study the factors influencing the prognosis of stroke in Parakou (Republic of Benin).

2. Methods

2.1. Setting

This study took place in Parakou which is the most city in the northern in Benin with about 300,000 inhabitants. Parakou had 2 Hospitals with capacity of stroke facilities (Military hospital and University teaching hospital). It accounted two neurologists, two cardiologists, two neurosurgeons and 3 intensive care specialists. Two CT-scan machine are available in this setting. No serious insurance for patients is available and each patient paid for his care.

2.2. Type and Period of Study and Recruitment

This is a prospective study which carried out over two periods: a 6-month inclusion phase from 1 January to 30 June 2013. A second phase of follow-up of survivors from 1 February to 30 September 2013. The study population is made up of all stroke subjects and hospitalized in one of the health facilities in the city of Parakou during the study period. During the study period, we therefore systematically and exhaustively recruited patients who met the inclusion criteria.

2.3. Sampling

The sample size was computed for an expected mortality rate of 29% (average mortality rate in a previous study in Benin; (Gnonlonfoun and al WJNS 2014) with a precision of results of 0.1 and a risk of 5%. The minimal number of subjects was 79

Systematic recruitment was done to includ all patients fullfilled inclusion criteria

2.4. Inclusion Criteria

To be included in this study, patients should to:

1) have been hospitalized in one of the above stroke structures during the study period;

2) having given consent (or failing that of a close relative) to participate in the study.

2.5. Exclusion Criteria

Excluded from the study were patients who:

1) Were hospitalized for transient ischemic attack, post-traumatic intracranial hematoma;

2) were in a coma and the consent or consent of a relative is not obtained.

The outcome measure was:

1) the vital prognosis defined by death at one or three months

2) the functional outcome of stroke defined by one or three month (Rankin score greater than 2). (Dependency = RANKIN > 2, Functional independency = RANKIN ≤ 2)

Each patient were followed since admission until 3 months to assess the primary endpoint.

Collection Tools

The data were collected after an initial interview (face to face interview or with the family of patient if he didn't answer to the question) and a full clinical examination at the time of admission and were completed as follow-up was done. For aphasic patients and those who cannot answer their parents were interviewed.

Sources of data were:

1) information provided by patients and their parents;

2) medical records;

3) patient care registers.

Data Collection Support

The information was collected for all patients. It included various headings relating to socio-demographic data, vascular risk factors, and initial examination data (NIHSS, Glasgow score, Temperature, systolic and diastolic blood pressure, complications during hospitalization, results of various paraclinic investigations, duration of hospital stay. A possible death was noted. Otherwise, outpatient treatment as well as one month and three month examination data were also recorded. The main dependent variable is the vital prognosis of cerebrovascular accident. The secondary dependent variable is the functional prognosis of cerebrovascular accident. These variables are based on the judgment criterion.

Independent variables studied are:

1) socio-demographic factors (age, gender, level of education, occupation, etc.)

2) vascular risk factors before stroke (hypertension, diabetes, alcohol consumption, smoking etc.)

3) clinical factors at admission (time between onset and admission to the first care system, mode of transportation to the hospital, Glasgow score, NIHSS, temperature.)

4) para-clinical actors (type of stroke and territory concerned, blood glucose, blood cells count, cholesterol level, etc.)

5) factors related to complications (pneumonia , phlebitis, etc.)

6) therapeutic factors. The good adherence was defined as patient seen with the same treatment (at the discharge)

7) Length of Hospital Stay

Statistical analysis

The data collected were processed and analyzed with the SPSS 16.0 software. The qualitative variables were expressed as a percentage and the quantitative variables on average +/- standard deviation. The chi-2 test (or Fisher's exact test as the case may be) was used for frequency comparisons and Student's t-test for mean comparison. For these tests, $p < 0.05$ was considered statistically significant.

Ethical considerations

The authorities of the different health facilities were informed and their authorization obtained. Informed consent of patients or their parents for aphasia or coma was obtained prior to their inclusion in the study.

3. Results

3.1. Sociodemographic and Clinical Characteristics of the Sample

Our study included 85 patients. There were 44 men (52%) and 41 women (48%), a sex ratio of 1.07. The age of our patients varied from 18 to 89 years with an average age of 56 ± 15 years. The distribution of subjects according to so-

cio-demographic and clinical characteristics is shown in Table 1.

3.2. Survival Prognosis of Stroke

One month prognosis

One month after stroke, 23 patients or 27% had died. Vascular events were not observed in any of the patients and a good adherence was observed in 47 of them (55%). The NIHSS varied between 01 and 22. Many factors were associated to one month death. The female has had a high risk of death. The high NIHSS at admission and loss of consciousness were associated to mortality. The patients who deceased at one month has had fever (mean T˚ = 37.6˚) were overweight (27.6 Kg/m^2), pneumonitis, had anemia (Hb = 11.9g/dl) hyperleucocytosis, hyperglycemia and hypercholesterolemia. Those data were summarized in Table 2 and Table 3.

Table 1. Characteristics of the sample, Parakou 2012.

Variables	N (%)
Sex	
Male	44 (52)
Female	41 (48)
Employment	
Employés	17 (20.5)
Self-Job	28 (33.7)
Retired	07 (8.4)
Other	33 (39.75)
Level of education	
No instruction	55 (66.3)
Primary school	03 (3.6)
Secondary school	22 (26.5)
University	05 (6.0)
Hospitalization department	
Neurology	36 (43.4)
Intensive Care Unit	26 (31.2)
Other	23 (27.7)
Type of stroke	
Ischaemic	43 (51.8)
Haemorrhage	30 (36.1)
Unknown	12 (14.5)
Vascular territory (ischaemic stroke)	
Middle cerebral artery	33 (39.8)
Posterior circulation	06 (7.2)
Anterior cerebral artery	04 (4.8)

Table 2. Factors influencing ome month death among stroke patients in Parakou, 2013.

Factors	Sample N (%)	Death N (%)	*P*
Sex			
Male	44 (51.8)	07 (15.9)	0.01
Female	41 (48.2)	16 (39.0)	
Age (years)			
15 - 44	15 (17.7)	03 (20.0)	
45 - 59	35 (41.2)	08 (22.9)	0.6
60 - 74	23 (27.0)	08 (34.8)	
75 - 89	12 (14.1)	04 (33.3)	
Past history of HTA			
Yes	57 (67.1)	15 (26.3)	0.5
No	28 (32.9)	08 (28.6)	
Diabetes mellitus			
Yes	15 (17.6)	05 (33.3)	0.3
No	70 (82.4)	18 (25.7)	
Pneumonitis			
Yes	16 (18.8)	12 (75.0)	0.0001
No	69 (81.2)	11 (15.9)	
Phlebitis			
Yes	02 (2.4)	02 (100.0)	0.07
No	83 (97.6)	21 (25.3)	
Stroke subtype			
Ischaemic	43 (50.6)	11 (25.6)	
Haemorrhagic	30 (35.3)	07 (23.3)	0.4
Unknown	12 (14.1)	05 (41.7)	

Three-month prognosis

Twenty-seven patients died at 3 months, 32% of deaths. No vascular events were noted and 54 subjects (64%) had good therapeutic compliance. The NIHSS ranged from 01 to 20. Thirty-two (55%) of the survivors were independent; The Barthel index had extremes of 20 and 100. Only occupation and pneumoniae were associated to 3 months death. The housewives had high risk of death than other. Among the patients with pneumonitis during hospitalization 75% were deceased at 3 months.The factors associated to 3 months death were summarized in Table 4.

3.3. Functional Prognosis of Stroke

At one month 29 (47%) of the survivors were independent (Rankin < 2) and the Barthel score varied between 01 and 100. The factors influenced the independence

Table 3. Factors influencing one month death among stroke patients in Parakou, 2013.

Factors	Living Mean (±SD)	Deceased Mean (±SD)	*p*
Age (years)	54.1 (±15.2)	59.9 (±15.0)	0.09
NIHSS	10.8 (±5.5)	18.1 (±5)	0.0001
Glasgow score	13.8 (±2.4)	11.1 (±4)	0.001
Systolic BP (mmHg)	162.9 (±40.6)	180.9 (±34.3)	0.06
Diastolic BP (mmHg)	100.3 (±23)	103.5 (±25.3)	0.6
Temperature (˚C)	37.1 (±0.4)	37.6 (±0.6)	0.001
BMI (Kg/m^2)	24.2 (±4.1)	27.6 (±7.4)	0.01
Hb	12.9 (±1.5)	11.9 (±1.7)	0.03
Leucocyst count	7072.2 (±3236.1)	9883 (±2915.4)	0.001
Thrombocyst	244.7 (±79.2)	241.9 (±79.7)	0.8
Cholesterol (g/l)	1.7 (±0.4)	2 (±0.5)	0.002
LDL-cholesterol (g/l)	1 (±0.4)	1.3 (±0.4)	0.005
Glycaemia (g/l)	1.2 (±0.7)	1.7 (±0.9)	0.01
Lenght of Hospital Stay (days)	11.1 (±8.3)	07 (±5.8)	0.05

Table 4. Factors influencing 3 months death among stroke patients in Parakou, 2013.

Factors	Sample N (%)	Death N (%)	*p*
Occupation			
Housewives	28 (32.9)	16 (57.1)	
Senior executives	17 (41.2)	03 (22.9)	
Traders	10 (11.8)	1 (10.0)	
Workers and craftmens	09 (10.6)	01 (11.1)	0.02
Farmers	09 (10.6)	01 (11.1)	
Retired	07 (08.2)	03 (42.9)	
Others	05 (05.9)	02 (40.0)	
Pneumonitis			
Yes	16 (18.8)	14 (87.5)	0.001
No	69 (81.2)	15 (21.7)	

were the initial neurological impairment (NIHSS at admission), the length of hospital stay and the weight. Those data were summarized in Table 5.

4. Discussion

At the end of our work, the following results were obtained: 1) the mortality rate per stroke in the first month was 27%; in the third post-stroke month, it was 32%; 2) many clinical and paraclinic factors have been identified as influencing prognosis.

Table 5. Factors influencing functional outcome among stroke patients in Parakou, 2013.

Factors	Independent Mean (±SD)	Dependent Mean (±SD)	*p*
Age (years)	50.8 (±15.1)	57.0 (±15.0)	0.1
NIHSS	7.7 (±5.7)	13.6 (±3.5)	0.001
Weight (Kg)	70.5 (±12.2)	63.9 (±10.7)	0.03
Lenght of Hospital Stay (days)	7.8 (±4.5)	14.0 (±9.7)	0.001

The general objective of this study was to study the factors influencing stroke prognosis in Parakou. To meet this objective, we carried out a prospective analytical study. The collection of information began in the first hours following the entry of the patients and the data were supplemented during the regular follow-up of these during both the hospital stay and after discharge. Since health centers do not have a reliable database and follow-up of certain patients who do not return after their return home is not carried out, retrospective use of medical records is not the prospective approach adopted. It appears that the prospective data collection is the most suitable method for our study. Furthermore, life expectancy was assessed by survival or not, which is a relevant objective criterion. The score of Rankin has a correct inter-observer reproducibility and enabled us to appreciate functional disability.

The mean age of the subjects in our population was 56 +/− 15.3 years. This result is similar to that of Beyiha and al [13] in Douala, Walker *et al.* [14] in Banjul who found an average age of 56 and 58 years respectively, as well as that of Apetse *et al.*, who noted an average age of 58 years in Lomé [15].

A male predominance (52%) was noted in our study; This observation agrees with that of Zhou and al [16] who have noted 51% of male subjects in Limoges; This could be explained by the frequency of certain risk factors (alcoholism, smoking) in men but Sène Diouf and al [17] and Kouna-Ndouongo and al [18] observed a female predominance. High blood pressure (67%) was the most common factor. This result corroborates the data of the literature.

Ischemic stroke was predominantly noted in our study. The same is true of work done in Nouakchott [19], Dakar [20], Singapore [21]. But other authors have noted a predominance of hemorrhagic strokes [13] [22]; other old studies reporting a high proportion of hemorrhagic strokes.

Our study found a mortality rate of 27% at 1 month. This result is similar to that of Walker and al [14] who recorded 27% in Banjul in 2003 and Sene Diouf and al [17] who in Dakar found a 29% mortality rate in 2005 on the thirtieth day. But this rate is lower in studies conducted in developed countries: 13% in Canada in 2006 [23]; 13% in Switzerland in 2010 [24]. The mortality rate at 3 months at the end of our study was 32%. This rate is higher than in Italy in 2006 [25]; In France in 2010 [16]. The disparity observed between the results could be explained by the best technical platform available to developed countries for the management of stroke.

We have not noticed an influence of age on the prognosis. On the other hand, for Longo Menza *et al.* in the Democratic Republic of the Congo [26], Sène Diouf *et al.* in Dakar [17], Nedeltchev *et al.* [24] in Switzerland, advanced age is a factor associated with mortality.

In our study, the female sex was associated with a poor prognosis. Walker *et al.* [27] following a literature review in 2009 also concluded that stroke tended to be more severe in women with a one-month mortality rate of 25% versus 20% in men. Longo-Menza *et al.* [22] found that mortality was significantly higher in males. For Sene Diouf *et al.* in 2006 [17], sex is not associated with mortality. This association observed in our study could be explained by the role of the hormonal factor.

In our study, the more severe the initial neurological deficit, the greater the risk of death in the first month. This conclusion is consistent with the literature. For example, Koton *et al.* [28] in Israel, Nedeltchev *et al.* in Switzerland [24], Wahab and al in Nigeria [29] found the same.

Our study also showed that altered consciousness increased the risk of death. El-Sheikh after a study carried out in Egypt [30], Bathia *et al.* after work carried out between February 2000 and July 2001 [31] had also reached this conclusion.

This finding is also consistent with the results of Ong *et al.* in Singapore in 2002 and Mohan *et al.* in the United Kingdom in 2009 [19] [31].

The existence of hyperthermia is a factor of poor prognosis in our study. This observation agrees with those of Wang *et al.* in Australia [32] and with those of Koton in Israel [28]. Infections and a dysregulation of systems involved in thermoregulation may explain hyperthermia in stroke patients.

In our study, there was an association between overweight and death (p = 0.01).

This finding is not the same as the result found by Doehner, whose study conducted in Germany on 4428 stroke patients revealed that those overweight and obese had a better life expectancy at 30 months [33]. A study conducted in Korea Of the 1592 patients followed over an average duration of 4 years found an association between long-term mortality and BMI only in the lean [34]. The disparity between these results could be explained by the difference between the size of the samples and also by the difference between the durations of the follow-up of the patients.

The occurrence of complications including pneumonia was associated with an increased risk of death. In a study conducted in Germany, Al-Khaled *et al.* [35] also concluded that pneumonia is the type of complication with the highest statistical significance with both intra-hospital and 3-month mortality.

Our study shows that the nature of the stroke does not affect the prognosis. But for Longo-Menza [26], ischemic strokes are associated with higher mortality, whereas, according to Ong *et al.* [19], the hematomas are associated with it.

Our results reveal a significant association between mortality and hyperglycemia at entry. This observation is also made by many authors. Thus, Capes *et*

al. [36] in studies of populations of non-diabetic patients with ischemic stroke; Nedeltchev and al. in patients with ischemic stroke have reached the same conclusion. Capes and al [37] after a literature review concluded that the relative risk of intra-hospital mortality or thirtieth day associated with an initial blood glucose greater than 1.08 - 1.44 g/L was 3.07 in non-diabetic patients and 1.3 in diabetics regardless of the type of stroke. The deleterious effect of hyperglycaemia may be explained by the fact that the onset of stroke leads to a release of stress hormones, increases cerebral edema and increases the risk of hemorrhagic transformation of ischemic events.

The proportion of deaths in the third month was higher among housewives. The fact that this category, which is characterized by a lack of income-generating activity and a propensity to obesity, is associated with a poor life expectancy, could be justified by the lack of financial resources leading to poor compliance.

Age is not a factor associated with functional development in our study. They concluded that young age was a good prognostic factor in the short term.

Our study reveals that sex is not associated with functional independence. This finding is consistent with data from other studies [38] [39]. But for Denti and al in Italy in 2013, females were associated with poor functioning [39]. All of our finding associated factors to mortaliy were identified in the recent systematic review [40].

The most limitation of this study was the small sample size but the one month mortality rate was close with other reported in our country [41].

5. Conclusion

This study shows that stroke mortality remains high with a high level of disability in Parakou. Numerous factors influencing the vital and functional prognosis of the condition were identified in both the first and third months. Taking these factors into acute phase management strategies could improve both the prognosis and functional prognosis of stroke patients. Our study revealed that the prognosis of stroke is still severe in Parakou.

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