Predictive Factors of Mortality of Stroke in the Neurology Department of Hujr of Befelatanana in Antananarivo

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Abstract

Introduction: Stroke is a major public health problem in the world. In Madagascar, mortality from strokes is still relevant. Evaluating predictors of mortality would allow better treatment.

Methods: This is a retrospective, descriptive and analytical study of the records of patients admitted to the neurology department during the period January 2015 to December 2019. There have been 1,565 cases of stroke.

Results: The death rate from stroke ranges from 6% to 11%. Demographic characteristics are not predictors of mortality. Clinical features; especially the onset of complications are the predictors of death in stroke. Hemorrhagic stroke was a poor prognosis. Hospital stays of less than 10 days have been associated with mortality in patients with stroke. The NIHSS score has been a good prognostic tool for any type of stroke. For ischemic stroke, an ASPECTS score ≤ 7 was associated with mortality. For hemorrhagic stroke, the ICH score allows a good evaluation of the prognosis of these strokes.

Conclusion: The establishment of a neurovascular unit in the University Hospital JR of Befelatanana would help better manage patients with stroke and other cerebrovascular diseases. National stroke surveys are needed to better identify national priorities.

Keywords: ASPECTS; ICH score; Mortality; Predictors; Stroke

Introduction

Strokes are the cause of significant mortality in the world, where they occupy third place in industrialized countries. In developing countries they are ahead of infectious diseases including pulmonary infections, diarrheal diseases, tuberculosis, HIV/AIDS and malaria [1]. They remain frequent and serious because of their high mortality and sequelae that they generate. They are one of the leading causes of death and disability in the world [2] Several factors are known to favor the occurrence of death during the first 30 days of stroke. The occurrence of death during stroke is multifactorial, it may be due to direct complications of stroke, but also to complications of prolonged decubitus. Thus, advanced age, impaired consciousness, severe stroke with involvement of large intracerebral vessels, atrial fibrillation, hyponatremia, hyperglycemia and the onset of aspiration pneumopathy are known to be factors. Predictors of mortality during stroke [3].

Our study aims to determine the association between the occurrence of death and certain factors known in the literature and then to determine the strength of the association between these factors and mortality during the first 30 days of stroke in order to improve their supported.

Materials and Methods

It's a cross-sectional, monocentric, retrospective, descriptive and analytical study of patients admitted to the neurology department of University Hospital JR Befeltanana, for stroke from January 1, 2015 to December 31, 2019 with inclusion criteria patients admitted for stroke listed in the register of the neurology department, during the study period and whose diagnosis was confirmed by the clinic and/or by brain imaging. For exclusion criteria, patients admitted for stroke during this period, but whose records were incomplete or incorrectly completed, were excluded. The data was collected from a pre-established survey form and collected by using the medical records of hospitalized patients, and after that was entered, processed and analyzed on a computer, using Word® software for word processing, Excel® for graphics processing. Data from the survey of inpatient medical records were entered and analyzed using Epi Info® 7.1.3 software. To establish the predictive factors for stroke mortality, the odds ratio (OR) was calculated for each parameter with its 95% confidence interval. To confirm the value of the OR, the Chi square test is used. of Pearson with its corresponding p-value and when the conditions of applications are not filled, one uses the test of Fisher Exact. Statistical significance is set at $p \leq 0.05$.

Results and Discussion
Demographic characteristics
Gender and age group

Age range	Total	Living	Died	Odds Ratio	p value
< 45 years	245	220	25	1,08[0,68-1,69]	0,74
45 à 64 years	824	751	73	0,83[0,59-1,16]	0,26
`≥ 65 years	496	443	53	1,18[0,83-1,69]	0,34
Gender				0,78[0,56-1,1]	0,08
Male	764	682	82		
Fémale	801	732	69		

In our study, more than half of the patients are aged 45 to 65 (52.7%), but strokes were also observed in young subjects under 45 (15.7%). The p values obtained are not significant for the age group.

Demographic factors	Your study	Other studies
Age	Mean = 57,3 years p> 0,05	Mialitiana. R : Mean = 58 years Rasolonjatovo : Mean = 59,88 years Moalla et al (2020) = 49,6 years Alhazzani et al : p > 0,05
Gender	Female predominance p = 0,08	Kaduka et al : < 0.001 Rasolonjatovo : Sex Ratio = 0,8 Kaduka et al : Female predominance Kaduka et al : p = 0,144

Clinical characteristics
History and risk factors

The major risk factor encountered during our study is especially arterial hypertension. Most of the patients, i.e. 1,375 (87.8%) presented a history of arterial hypertension, of which 1,104 i.e. 70.5% were grade 3. Alcoholism and smoking constitute the second major risk factor during our study. It was observed that 523 patients or 33.5% had a history of alcoholic smoking. Dyslipidemia was found in 457 patients, or 39.2%.

The presence of one or more episodes of stroke is also a risk factor. It was found that 206 patients or 13.1% had a history of stroke including 44 patients or 2.8% in first degree relatives. The history of heart disease was observed in 98 patients or 6.2% of which 42 patients or 2.7% are hypertensive heart diseases; arrhythmias were observed in only 7 patients (0.4%).

There is an association between the presence of a history of heart disease in a patient and the risk of death in the event of a stroke. Dyslipidemia also increases the risk of death from stroke. Alcoholism is a risk factor for stroke during our study, it is associated with the risk of death in case of stroke. Although an important risk factor for developing a stroke, high blood pressure is not associated with the risk of death of the stroke patient.

Background	Total Patients	Living	Died	Odds Ratio	p value
HBP	1 375	1 243	132	0,96[0,58-1,59]	0,86
Stroke	206	191	15	0,70[0,41-1,23]	0,21
Diabetes	104	90	14	0,70[0,41-1,23]	>0.05
Alcohol smoking	523	459	54	1,53[1,09-2,16]	0,01
Cardiopathy	98	80	18	2,31[1,34-3,98]	0,002
Dyslipidémia	457	428	29	2,31[1,34-3,98]	0,002

Background	Your study	Other studies
High blood pressure	p = 0,86	Kouakou N'goran et al : p > 0,05 Mialitiana : p > 0,05
Alcohol smoking	p = 0,01	Coulibaly et al p =0,626
Cardiopathy	p = 0,002	Levine et al : p < 0,0001
Stroke	p = 0,21	Coulibaly et al p = 0,152
Dyslipidemia	p = 0,002	Coulibaly et al p = 0,003
Diabetes	p > 0,05	Ekeh et al p > 0,05

Reason for entry

Patterns	Total	Living	Died	Odds Ratio	p value
Hémiplegia	1 257	1 154	103	0,52[0,36-0,76]	0,0006
Vigilance disorder	61	47	14	3,05[1,63-5,66]	0,0003
Cephalalgia	86	71	15	2,14[1,19-3,84]	0,009
Convulsion	41	32	9	2,80[1,31-5,99]	0,006
Dizziness	21	19	2	1,01[0,23-4,37]	>0,05
Others	99	94	5	0,49[0,20-1,23]	>0,05

Entry patterns	Your study	Other studies
Vigilance disorder	p = 0,0003	Fekadu et al : p = 0,033 Ekeh et al : p < 0,001
Hemiplegia	p = 0,006 OR = 0,52[0,36-0,76]	Alhazzani et al : OR = 2.605 [1,559-4,352] Fekadu et al : p = 0,589 Arcancia MD : p=0,002
Cephalalgia	p = 0,009	Fekadu et al : p = 0,392 Moalla et al : p = 0,035

Parameters, clinical scores and complications at entry

Parameters	Total	Living	Died	Odds Ratio	p value
Glasgow ≤ 14	22	12	10	8,29[3,52-19,52]	<0,0001
NIHSS > 13	399	309	90	8,03[5,39-11,98]	<0,0001
MRS > 2	1 293	1 167	126	10[2,46-40,94]	0,0001
Fever ≥ 38°C	84	68	16	2,35[1,32-4,16]	0,003
Complications :	609	480	129	11,4[7,2-18,12]	$<10^{-5}$
Neurological	35	18	17	9,84[4,95-19,54]	$<10^{-5}$
Cardiac	338	254	84	5,73[4,04-8,11]	$<10^{-5}$
Décubitus	415	312	103	7,58[5,26-10,92]	$<10^{-5}$

Clinical score	Your study	Other studies
Glasgow	OR = 8,29[3,52-19,52] p < 0,0001	Fekadu et al : OR = 9,00 [3,76-21,54] p < 0,001
NIHSS	OR = 8,03[5,39-11,98] p < 0,0001	Fekadu et al : OR = 8.01 (2.45–26.23) p = 0,001
MRS	OR = 10[2,46-40,94] p = 0,0001	Quinn et al : OR = 5.48 [3,99-7,51] p = 0,001

Complications during hospitalization

Complications	Total	Alive	Died	Odds Ratio	Valeur p
Neurological	373	224	149	382[94-1556]	$<10^{-5}$
Respiratory	437	295	142	60[30-119]	$<10^{-5}$
Cardiac	131	42	89	47[30-73]	$<10^{-5}$
Deep vein thrombosis	10	3	7	22[5,9-89]	0,000006
Pulmonary embolism	8	1	7	69[8-562]	0,0000002
Skin	151	129	22	1,70[1,04-2,76]	0,02
Digestive	282	257	25	0,89[0,57-1,40]	0,32

In the present study, death during hospitalization is strongly associated with the onset of complications during stroke. Of the 151 deaths recorded, 147 patients or 97% experienced complications during their hospital stay. Various complications have been observed. There were stroke-related neurological complications such as intracranial hypertension, cerebral involvement, worsening deficit, autonomic disturbances, vasospasm and rebleeding, seizures, and acute hydrocephalus. There were also complications of prolonged bed rest such as digestive, respiratory and cutaneous and metabolic complications or cardiac complications from the underlying atheromatous disease. Neurological complications are more frequent compared to other complications. Our study joins that of Moalla et al on the prognostic factors of mortality from arterial stroke with 58% neurological complications, 24.3% infectious complications and 15.5% metabolic complications [4]. Indeed, for 23 to 50% of patients, neurological complications are a major cause of death in stroke victims. Patients may be at risk for cerebral edema, hemorrhagic transformation of ischemic stroke, and seizures. In addition, patients are at risk of stroke recurrence. It is particularly high the first time after the stroke episode (about 10%) and decreases over time. Other acute neurological complications may occur, such as a delusional syndrome, pain of central origin (Déjerine-Roussy syndrome) or headache. Stroke-related complications are a major cause of death in the acute and subacute phases. of stroke. The majority of them develop in the first weeks after the stroke episode [5]. In the study by Fekadu et al in Ethiopia, the immediate causes of hospital mortality suspected by clinicians were mainly intracranial hypertension followed by respiratory distress secondary to aspiration pneumonia [6].

Appearance of thromboembolic complications during hospitalization. The presence of these complications is strongly associated with hospital mortality (p < 0.0001). This association was demonstrated by Alhazzani et al for pulmonary embolism, whereas the existence of deep vein thrombosis is not significantly associated with patient death during the 30 days after stroke [7].

Etiology

Etiology	Total	Living	Died	Odds Ratio	Valeur p
High blood pressure	446	426	20	0,35[0,22-0,57]	< 0,0001
Malformations	113	89	24	2,81[1,73-4,58]	< 0,0001
Small arteries diseases	144	139	5	0,31[0,13-0,78]	0,01
Territorial stroke	173	130	43	3,93[2,64-5,84]	< 0,0001
Perforant stroke	266	236	30	1,24[0,81-1,89]	0,16

The most common etiology observed during our study was arterial hypertension, it represents 28% of stroke etiologies. High blood pressure is an important, if not the main risk factor associated with stroke. Abnormally high blood pressure is a condition whose negative effects worsen over time. It affects vital organs like the heart and blood vessels in several parts of the body. Damage to these vital areas can cause atherosclerosis and heart disease as well as stroke. In fact, it is estimated that 56.4% of strokes in women and 66.1% in men are attributable to high blood pressure. The age-adjusted risk of stroke in hypertensives is 3.1 in men and 2.9 in women compared to normotensives. Controlling high blood pressure through treatment prevents stroke [8].

Etiology	Your study	Other studies
High blood pressure	p = 0,00002	Moalla et al : p < 0,001
Malformations	p = 0,00001	Moalla et al : P = 0,018
Small arteries diseases	p = 0,01	Siegler et al : p < 0,001
Territorial stroke	p < 0,0001	Siegler et al : p < 0,001
Perforant stroke	p = 0,16	Rasaholiarison et al : low mortality

Paraclinical characteristics
CT Scan

Variables	Total	Living	Died	Odds Ratio	p value
Type of stroke					
Ischemic	485	451	34	0,62[0,42-0,92]	0,02
Hemorragic	630	586	44	0,58[0,40-0,84]	0,003
Cerebral thrombosis	11	11	0	NA	0,28
ICH ≥ 1	29	18	11	13,29[3,80-46,48]	< 0,0001
ASPECTS ≤ 7	33	18	15	15,45[4,36-48,55]	0,0002
Complications	931	854	77	NA	0,0001
without CT scan	454	382	72	0,39 [0,28- 0,55]	$<10^{-5}$

Whatever the type of stroke, there is always a risk of death but the association is stronger during hemorrhagic stroke (p = 0.003). The ICH score was established in 120 patients, 29 patients had an ICH score ≥ 1. The mean score was 0.88. After statistical analysis, there is a correlation between the occurrence of death during the first 30 days and the increase in the ICH score.

The ASPECTS score was established from the 132 records of patients with DALYs, 33 patients had a score ≤ 7. The average score observed was 8.33. The occurrence of death during the first 30 days is inversely proportional to the value of the ASPECTS score (p = 0.0002).

Score	Your study	Other studies
ICH > 1	p = 0,002	Hemphill et al: p < 0,005 Gnazegbo et al : mortality equal to predicted mortality
ASPECTS ≤ 7	p = 0,0002	Fahmi et al : ASPECTS score correlated with the outcome of the patient

Biological abnormalities

Abnormalities	Total	Living	Died	Odds Ratio	p value
Inflammatory syndrome	673	570	103	3,17[2,21-4,54]	$<10^{-5}$
Ionic disorders	94	73	21	2,96[1,77-4,97]	< 0,0001

During the present study, 43% of the patients presented with a biological inflammatory syndrome with an elevated CRP level and neutrophilic polymorphonuclear predominant leukocytosis. Among them, 15% died. An association has been observed between the presence of biological inflammatory syndrome and the death of the patient. Our study is similar to that of Boehme et al on infections during the 30 days following the stroke with 29% of infections in patients with a first episode of stroke and 32% in those who have more than one episode of stroke. Stroke. Post-stroke infections acquired during hospitalization or after discharge are associated with morbidity, mortality and deterioration of functional outcome during the 30 days following the stroke [9]. Elevated CRP numbers within 12 to 72 hours post-stroke are associated with a 2-fold increased risk of death. The relationship between increased CRP and post-stroke mortality may partly reflect dysfunction endothelial cells induced inflammation and platelet activation [10].

The appearance of hydro-electrolyte disorder is frequent during stroke. During our study, ionic disorders were observed in 94 patients, i.e. 6% with a 22.3% mortality rate. There is an association between the appearance of these disorders and the occurrence of death during hospitalization. Among these hydroelectrolytic disorders, we can mention: hypokalemia, hyperkalemia and especially hyponatremia. Hyponatremia is the most frequent hydroelectrolytic anomaly encountered during hospitalization. It develops during

hospitalization as a complication of a pathology such as heart failure, stroke, diabetes, liver and kidney disease or as iatrogenic complications. In the study by Mohan et al on the prevalence of hyponatremia and its association with mortality, the risk of death in hyponatremic patients is significantly elevated [11].

Conclusion

Stroke is always a major public health problem. This is the prerogative of subjects over 65 years of age, but cases of stroke have also been observed in young subjects under 45 years of age. Its incidence is increasing and is increasingly of interest to young subjects (median age 57 years).

We set ourselves the objectives of determining the predictive factors of mortality during the first 30 days of stroke and this study allowed us to know that certain modifiable risk factors were involved in the occurrence of mortality: dyslipidemia, consumption of alcohol and tobacco.

Clinically, the following prognostic elements are predictive factors for hospital mortality during the first 30 days: associated hemiplegia, seizures, headaches, impaired consciousness, the presence of complications on admission, a score score below 14, an NIHSS score above 13. And that during hospitalization, the appearance or aggravation of complications and a length of stay of less than 10 days are predictive factors for mortality. The establishment of regular monitoring during the first 10 days of the critical phase of strokes is therefore useful in order to reduce mortality. On the radiological level, hemorrhagic strokes and the presence of complications seen on brain scans are elements of poor prognosis. For ischemic stroke, an ASPECTS score ≤ 7 is a predictive factor for mortality at 30 days of stroke. Cerebral venous thrombosis had a good prognosis. The establishment of prognostic scores from the start would make it possible to better monitor the evolution of patients and to detect a possible worsening and thus to put in place corrective measures to the situation.

Acknowledgements

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