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Stroke: Lethality and Associated Factors in the Internal Medicine Intensive Care Unit at the University Clinics of Kinshasa, Democratic Republic of Congo

Christian Kisoka Lusunsi [a,b*], Fabien Kintoki Mbala [a] and Benjamin Longo-Mbenza [a,b,c]

[a] Department of Internal Medicine, University of Kinshasa, Kinshasa, Democratic Republic of Congo.
[b] Department of Public Health, Lomo University of Research, Kinshasa, Democratic Republic of Congo.
[c] Faculty of Health Sciences, Walter Sisulu University, Mthatha, South Africa.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background and Aims: Stroke is a scourge and one of the main threats to public health (PH). the present study aims to research the lethality of stroke as well as its determinants at the University Clinics of Kinshasa (UCK).
Materials and Methods: This study of descriptive and analytical clinical case series was carried from January to December 2019 at the UCK Internal Medicine Intensive Care Unit, a convenience type sampling. Logistic regression was used to search for factors associated with stroke lethality and the value of $p<0.05$ was chosen as the statistical significance level.

**Corresponding author: E-mail: christiankisoka1@gmail.com;*

Results: Out of a total of 537 patients admitted, 60 had a confirmed diagnosis of strokes, i.e. 11.17%, their average age was 66 ± 10.6 years (range 42 to 90 years), men were more numerous than women (68.3% n=41/60 versus 31.7% n=19/60), the ischemic type was predominant with 65% (39/60). The cardiovascular risk factors identified were high blood pressure (HBP), tobacco, alcohol, diabetes mellitus (DM), previous stroke, heart failure and myocardial infarction in the respective proportions of 70%, 60%, 45 %, 28.3%, 28.3%, 4%, and 3.3%. A lethality of 55% was found with associated factors: coma, fever and sepsis.
Conclusion: A lethality of 55% has just been found in the Intensive Care Department of Internal Medicine of the UCK with the associated factors: coma, fever and sepsis.

Keywords: Stroke; lethality; cardiovascular risk factors; factors associated with lethality.

1. INTRODUCTION

The World Health Organization (WHO) defines stroke as "the rapid development of localized (or global as in subarachnoid hemorrhage) clinical signs of cerebral dysfunction lasting more than 24 hours or leading to death, with no apparent cause other than a vascular origin" [1].

Globally, stroke is a scourge and one of the main threats to public health (PH). Their worldwide incidence, which only increases with age in a formidable and alarming way, Of 35 million deaths attributable to chronic noncommunicable diseases that occurred worldwide in 2005, stroke was responsible for 5.7 million (16.6%) deaths, and 87% of these deaths occurred in low-income and middle-income countries [2]. Driven by increasing size and aging of populations, and escalating prevalence of risk factors such as hypertension, tobacco use, unhealthy diet, physical inactivity, and obesity, stroke is becoming a major cause of premature death and disability in developing countries [3,4]. It is important to emphasize that for 30 years, the overall burden of stroke in the world has been decreasing in high-income countries and exploding in low-income countries [5–9]. Stroke is the second cause of death after myocardial infarction, the second cause of dementia after Alzheimer's disease and the third cause of acquired disability in the world [10].

In Sub-Saharan Africa (SSA), due to the absence of death registers or functioning surveillance networks in the vast majority of countries, basic data such as the incidence rate, prevalence or mortality are not not known with precision. Stroke is the second leading cause of death worldwide and in sub-Saharan Africa and is associated with 10% of global mortality [11].

In the Democratic Republic of Congo (DRC), we have data published in 2013 covering the period from 1990 to 2010 on the global burden of ischemic and hemorrhagic strokes, concerning only incidence, mortality and years of quality life lost. because of stroke-related sequelae [7]. As for the incidence, overall, it was estimated at 16.9 million new cases in 2010 and 10.3 million new cases in 2013 [6–8]. The incidence of ischemic strokes varied from 127.96 new cases per 100,000 inhabitants in 1990 to 163.54 new cases per 100,000 inhabitants in 2010 and that of hemorrhagic strokes increased from 53.34 new cases per 100,000 inhabitants in 1990 74.31 new cases out of 100,000 in 2010 [7]. In terms of mortality, data in our possession indicate that in the DRC, in 1990, ischemic strokes resulted in 49.09 cases of death per 100,000 inhabitants whereas in 2010, 54.36 cases of death per 100,000 inhabitants were attributed to them [7]. Hemorrhagic strokes were responsible for 66.79 deaths out of 100,000 in 1990 and 76.71 out of 100,000 inhabitants in 2010 [7].

Studies conducted by Kintoki F and al have shown the relationship between global warming and the increase in the incidence of strokes in the DRC in older people [12].

Given the lack of data in the UCK Internal Medicine Intensive Care Unit on post-stroke lethality, the objective of our work is to study post-stroke lethality and to look for associated factors.

2. MATERIALS AND METHODS

The present clinical case series study was Cross-sectional retrospective and analytical during the period from January 1 to December 31, 2019. The Intensive Care Unit of the Department of Internal Medicine of the UCK was chosen as the setting for the study. Carrying out this study.

The following tools were useful for carrying out this work: the medical register, medical records, data collection sheets, a computer with Excel

software for data entry and SPSS for statistical analysis.

All adult patients (aged ≥ 18 years), hospitalized in the Intensive Care Unit of Internal Medicine, with a diagnosis of stroke on the cerebral scanner, and having the parameters of interest in the file, were included in the present study. Sampling for this study was convenience.

The systematic analysis of registers and medical files made it possible to obtain several clinical pieces of information. The following elements were chosen as parameters of interest socio-demographic data: age, sex, profession, marital status, level of study, types of stroke; clinical data: symptoms, history, physical signs, paraclinical data, vital outcome. Stroke was defined on the basis of specific lesions on brain scan; hemorrhagic-type stroke was defined on the basis of hyperdensity images on the cerebral scanner; ischemic stroke was defined on the basis of hypodensity images on the cerebral scanner; hypertension was defined either by a history of hypertension or by BP values ≥140 mmHg;

DM was defined either by a history of DM or by fasting hyperglycaemia ≥126mg/dl or occasional ≥200mg/dl; lethality retained the proportion of all patients who died from stroke among patients with stroke.

The data were entered on a computer using Excel software, analyzed using SPSS version 21 software on Windows, and presented in the form of tables or figures. The quantitative variables were presented in the form of means plus or minus Standard Deviation (SD) while the qualitative variables were presented in the form of a proportion (%).

The comparison of two means between two groups required the t-student test while the comparison between two proportions required the Pearson chi-square test. Multivariate analysis (logistic regression) was used to find the determinants of stroke lethality. The value of $p<0.05$ was chosen as the threshold for statistical significance.

3. RESULTS

3.1 Hospital Frequency

Out of a total of 537 patients admitted to the Intensive Care Unit, 105 had a diagnosis of stroke, of which only 60 had CT scan confirmation, ie a frequency of 11.17%.

3.2 General Characteristics of Stroke Patients

3.2.1 Socio-demographic characteristics

Stroke patients had a mean age of 66 ± 10.6 years with extremes ranging from 42 to 90 years. Men were more numerous than women in the respective proportions of 68.3% (n=41/60) and 31.7% (n=19/60), i.e. a male: female ratio of 2.2 (Fig. 1).

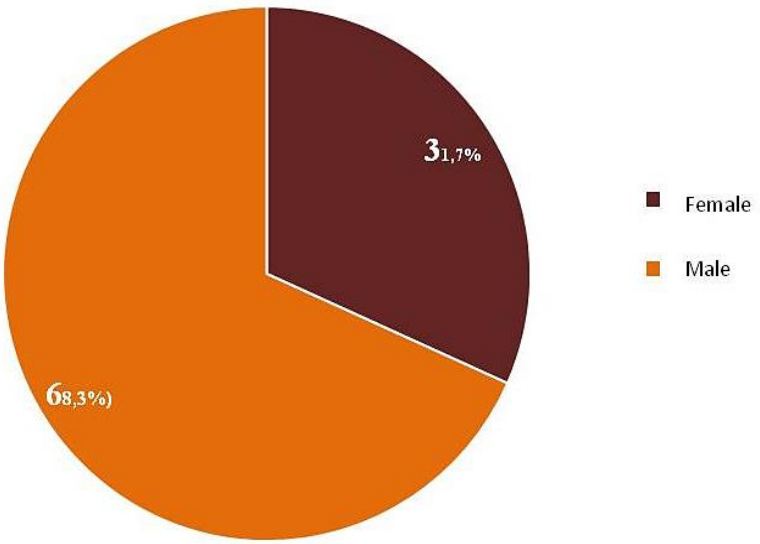

Fig. 1. Distribution of stroke patients by gender

Table 1. Socio-demographic characteristics

Variables	n	%
Age, year		
> 75	18	30
60-74	25	41.7
45-59	16	26.7
< 45	1	1.7
Occupation		
Unemployed	31	51.7
With a job	29	48.3
Marital status		
Singles	2	3.3
Married	43	71.7
widowers	15	25
Study level		
Without level	3	5
Primary	8	13.3
Secondary	19	31.7
University	30	50

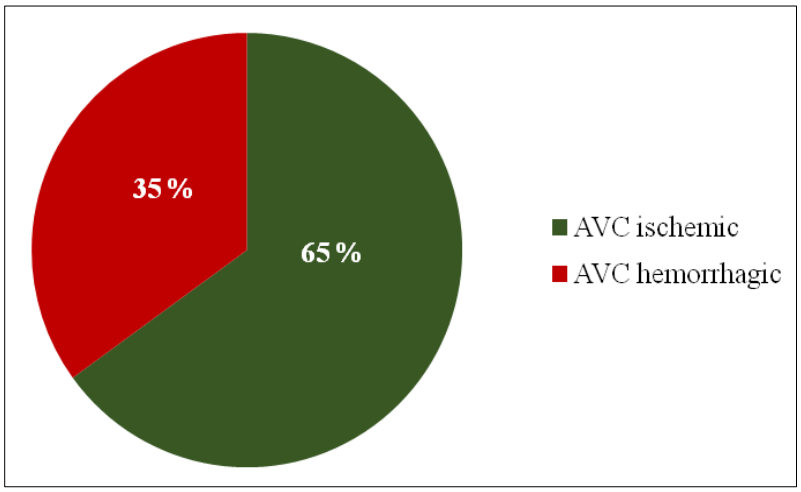

Fig. 2. Distribution of stroke patients by type

Patients with AVC had a frequency of admission which increased with age with a significant peak (71.7%) from the age of 60 years. The distribution was similar ($p<0.05$) between the unemployed and the employed (51.7% vs 48.3%). Married patients had a high proportion (71.7%) compared to single (3.3%) and widowed (25%). Patients with a university level represented practically half of the study population compared to those without a level, primary and secondary level, the respective proportions of which are: 5%; 13.3%; and 31.7%.

3.2.2 Hemodynamic and vital characteristics

The hemodynamic and vital characteristics of stroke patients were investigated in the present study. The results are shown in Table 2.

Patients with stroke had borderline average values of PAS and PAD in the respective values of 151.5 ± 32.1 mmHg and 89.7 ± 17.4 mmHg and high values of PAM and PP in the respective values of 171, 6 ± 39.7 mmHg and 63 ± 22.4 mmHg.

3.2.3 Biological and biochemical characteristics

The biological and biochemical characteristics of patients with stroke were researched and presented in Table 3.

Patients with AVC had high values of ESR in the averages of 46.9 ± 37.2 mm at the 1st hour, normal values of Hb, Ht, Cholesterol, in the

respective values of 11.9 ± 2, 8g/dl; 36.3 ± 7.6%; 188.2 ± 63.1 mg/dl; 103.4 ± 50.6 mg/dl and low HDL cholesterol values of 38.2 ± 7.2 mg/dl.

3.3 Types of Stroke

Fig. 2 shows a predominance (p>0.05) of ischemic-type stroke over hemorrhagic-type stroke in the respective proportions of 65% (n=39/60) and 35% (n= 21/60).

3.4 Clinics

The clinical manifestations of stroke patients were investigated. The results are shown in Table 4.

Coma, left hemiplegia, right hemiplegia, dehydration and fever were the manifestations identified in the stroke patient data in the respective proportions of 66.7%, 20%, 36.7%, 30% and 30%.

3.5 Cardiovascular Risk Factors

Cardiovascular risk factors identified in stroke patients were researched and presented in Table 5.

Previous stroke, hypertension, DS, heart failure, myocardial infarction, tobacco and alcohol were the risk factors found for the occurrence of stroke in the respective proportions of 28.3 %, 70%, 28.3%, 4%, 3.3% 65% and 45%; hypertension and tobacco being the most common factors.

Table 2. Hemodynamic and vital characteristics

Variables	Min value	Max value	Mean ± SD
SBP, mmHg	100	220	151.5±32.1
DBP, mmHg	50	130	89.7±17.4
MBP, mmHg	79	257	171.6±39.7
PP, mmHg	23	113	63.2±22.4

Table 3. Biological and biochemical characteristics

Variables	Min value	Max value	Mean ± SD
ESR, mm 1st hour	2	155	46.9±37.2
Hb, g/dl	4	16.9	11.9±2.8
HT,%	16	50	36.3±7.6
Total cholesterol, mg/dl	94	425	188.2±63.1
LDL, mg/dl	14.6	243	103.4±50.6
HDL, mg/dl	8	99.9	38.2±7.2

Table 4. Clinical manifestations of stroke patients

Variables	n	%
Coma	40	66.7
Left hemiplegia	12	20
Right hemiplegia	22	36.7
Dehydration	18	30
Fever	18	30

Table 5. Cardiovascular risk factors in stroke patients

Variables	n	%
Previous stroke	17	28.3
HBP	42	70
DM	17	28.3
Heart failure	3	4
Myocardial infarction	1	3.3
Tobacco	39	65
Alcohol	27	45

Table 6. Factors associated with stroke lethality in univariate equation

Variables	OR	CI	P-value
Coma	1.8	1.34-2.56	0.0001
Fever	2.9	1.39-6.40	0.002
Sepsis	3.1	1.46-6.59	0.001

Table 7. Factors independent of stroke lethality (multivariate analysis)

Variables	OR adjusted	95% CI	P-value
Coma	3.8	1.408-10.488	0.009
Fever	2.3	1.39-6.40	0.111
Sepsis	1.8	1.46-6.59	.277

3.6 Stroke Lethality and Associated Factors

3.6.1 Factors associated with stroke lethality

Of the 60 admissions for stroke, 33 had died, i.e. a lethality of 55%.

3.6.1.1 Univariate-analysis

The analysis of factors associated with univariate lethality was carried out. The following factors were analyzed: advanced age (≥ 60 years), gender, history of SD, MRC, IC, coma, Glasgow ≥ 7, PAS ≥ 190 mmHg, PAD ≥ 100mmHg, associated malaria, associated sepsis, history of stroke, fever, dehydration and hyperglycemia ≥ 110mg/dl. The results are shown in Table 6.

Coma, fever, and sepsis increased stroke lethality by 1.8, respectively; 2.9 and 3.1.

3.6.1.2 Factors independent of lethality in multivariate

The strength of the association of coma, fever and sepsis on lethality was assessed by logistic regression (multivariate analysis). The results are shown in Table 7.

In the multivariate analysis, only coma was independently and significantly associated with lethality with a 3.8-fold increase (P<0.009).

4. DISCUSSION

4.1 Hospital Frequency

Despite the results of a study conducted by Mboliasa and al [13] in the healthcare department, which placed stroke in the crosshairs of cardiovascular emergencies , and which represented 50.8% of all cardiovascular emergencies (32.52%), this work enabled us to observe a regression in the hospital frequency of stroke with 11.17%; a rate which is almost half of that found by Kintoki F, i.e. 23.5% [12], a quarter of that reported by Gombet T and al [14] at the CHU of Brazzaville, which showed a very high frequency, i.e. 49, 74%.

4.2 Risk Factors

4.2.1 Age

The present study affirms the impact of age as a non-modifiable risk factor involved in the occurrence of stroke with an average age of 66 ± 10.6 years, with a high incidence before 75 years, thus approaching studies already described in Africa [4,14–16].

4.2.2 Sex

The variability of the prevalence according to sex was described in our study. The predominance is male with a male: female ratio of 2.2 as in the majority of studies with a ratio between 1.14 and 1.5 [17–19] or even ratios of 2 [20]. Unlike the study by Yves N'da Kouakou N'goran et al at the Abidjan Cardiology Institute; who showed a female predominance with a ratio of 1.2 [16].

4.2.3 Hypertension

As in Africa or elsewhere, studies have shown that hypertension remains the main modifiable cardiovascular risk factor involved in the occurrence of strokes [4,6,7,20–23]. In our study, hypertension is in a proportion of 70%, followed by tobacco 65%, alcohol 45% and diabetes mellitus 28.3%. A succession of cardiovascular risk factors closes to that found in several studies having described the frequency of risk factors in black subjects with successively hypertension, smoking, diabetes, whereas in the white race, tobacco, hypertension, heart disease [23].

4.3 Types of Stroke

In our study, we observed a preponderance of ischemic strokes over hemorrhagic strokes as reported in the literature [21] and in numerous studies, in this case those by Gombet T and al at the CHU of Brazzaville [14] where hemorrhagic stroke represented only 35% of cases and Lecoffre C and al in France with 51.5% for ischemic stroke and 33.2% for cerebral hemorrhage [24].

4.4 Lethality

Expressed in the vast majority of studies, stroke contributes alarmingly to morbidity and mortality worldwide [2,6,7,25]. The present study showed a rebound in stroke-related lethality in the CUK internal medicine intensive care unit with a very high rate of 55%, which was in the past in full decline after the introduction of codified management of stroke. Stroke by the UCK Internal Medicine Service, and is twice that found by Touré K and al of 24.8 at the CHU FANN in Dakar [26]. The very high rates of hospital lethality, reflecting the seriousness of the disease, have been the subject of several studies around the world. Indeed, lethality is 27 to 44% in Gambia [27], 29.3% in Mauritania [28], 21% in Palestine [29]. We found a heavy toll even in the PRE: 30% in England [30]; 78.7% in Italy [31] for patients admitted to intensive care on an artificial respirator. In France, in a series of studies from 2008 to 2014 showed a drop in lethality of 12.5% [24].

4.5 Factors Associated with Stroke Lethality

It is important to know that infectious complications have already been elucidated as factors of poor prognosis [32]. After univariate analysis, it appears from our study that the occurrence of coma was significantly related to mortality with one; OR: 1.8 0-95% CI (1.34-2.56), especially fever and sepsis with respectively; OR: 2.9 at 95% CI (1.39-6.40) and OR: 3.1 at 95% CI (1.46-6.59).

In the multivariate analysis, only coma is independently correlated with lethality, as in most series [19,33–35] in which the low Glasgow score was a predictive factor for mortality (lethality) high, the expression of a poor vital prognosis and heavy sequelae. Hence the crucial interest of a daily assessment of the state of consciousness of patients admitted for stroke.

Terent and Andersson [36] highlighted the excess mortality associated with a temperature above 38°C as reported in the present study. Similarly, Reith J and al [37] have already shown that body temperature on admission was correlated with initial stroke severity, final infarct size, and mortality. Its deleterious effect for patients hospitalized for stroke was recently reported by Kuate-Tegue and al [34], also by our study; hence the major interest of looking for it on admission of the patient and of making a clarification. Because, it is most often linked to an infectious complication, especially bacterial and can sometimes testify to a non-infectious complication, such as thromboembolic complications: phlebitis or pulmonary embolism.

Pulmonary and urinary infections are the most frequent infectious complications during strokes [38,39] which can serve as a gateway to the occurrence of sepsis, a formidable factor found in our study and which multiplied lethality by 3.1.

5. CONCLUSION

The lethality of stroke and the factors associated with it have just been analyzed in the present study at CUK. Coma, fever and sepsis were identified in multivariate, but only coma presented an independent relationship.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The protocol for this study was submitted and approved by the National Health Ethics Committee (CNES) of the Ministry of Public Health of the Democratic Republic of Congo according to the Helsinki recommendations.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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