Analysis of risk factors for stroke in Kinshasa, Democratic Republic of Congo

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ABSTRACT: Stroke is a major public health problem in the Democratic Republic of Congo. The overall objective of this study is to analyze the risk factors for stroke in the hospital setting of Kinshasa. A descriptive interview survey was conducted among 105 patients hospitalized in Kinshasa who had developed stroke. The results show that the non-modifiable risk factors among the patients surveyed were advanced age (over 55 and 65 years for men and women, respectively), sex (predominantly male), and family history (hypertension and diabetes), whereas the modifiable risk factors were excessive tobacco and alcohol consumption, low consumption of fruits and vegetables, and regular consumption of vegetable oil. Intermediate risk factors included lack of physical activity, hypertension, diabetes mellitus, and abdominal obesity. The prevalence of stroke was ischemic and hypertension was the most important cardiovascular risk factor, followed by excessive alcohol consumption and smoking. The results obtained demonstrate the need for adequate management of cardiovascular risk factors in patients and prevention of recurrences.

KEYWORDS: Cardiovascular risk factors, Patients, Stroke, Kinshasa.

1 INTRODUCTION

Stroke remains a public health problem worldwide. Globally, it is the second leading cause of death [1], [2], [3], [4]. Relatively recent data indicate that the incidence of stroke remains stable between 1990 and 2016 [4]. Several studies conducted in sub-Saharan African populations indicate prevalences of risk factors for stroke [5], [6], [7]. These prevalences, which are lower in Western countries but alarmingly high in sub-Saharan Africa, may lead to higher disease burdens [4], [6]. They represent a burden not only for the family but also for the community. They occur more in low-income communities where they impose significant and avoidable costs in human, social and economic terms [8].

In the Democratic Republic of Congo and particularly in Kinshasa, a study conducted among the population reported that they are subject to several risk factors for stroke. These factors are present in Kinshasa and foreshadow an increase in the incidence of stroke in the coming years [6]. Non-modifiable risk factors include advanced age, gender, family history, and genetic factors, whereas modifiable risk factors include excessive smoking, alcohol abuse, sedentary lifestyle, and unbalanced diet. Intermediate risk factors include high blood pressure, diabetes mellitus, obesity, and chronic alcoholism. Environmental risk factors are manifested by domestic and occupational pollution [6], [9], [10].

The overall objective of this study is to identify cardiovascular risk factors in hospital patients in the city of Kinshasa. Specifically, the aim is to determine (i) the sociodemographic and economic characteristics of people who have developed a stroke, (ii) the frequency of modifiable risk factors, (iii) the frequency of non-modifiable risk factors, and (iv) the clinical profile of patients who have developed a stroke.

2 METHODS

2.1 STUDY AREA

A descriptive study was conducted from October 29 to November 30, 2014, in hospitals in the city of Kinshasa in the Democratic Republic of Congo. Kinshasa, the capital and largest city in the Democratic Republic of Congo (DRC) as well as in Africa, covers 9,965 km^2.

With an estimated population of 17 million in 2021, Kinshasa is the third largest city in Africa after Cairo and Lagos. It is the largest French-speaking agglomeration in the world, having surpassed Paris in the 2010s and is among the most populous agglomerations in the world. Kinshasa has the administrative status of a city and is one of the 26 provinces of the country. Its inhabitants are called Kinois. It has been occupied for several centuries by Bantu peoples (Teke and Humbu) and became a commercial center during the 27th and 28th centuries. In 1881, the explorer Henry Morton Stanley named the city Leopoldville in honor of the Belgian king Leopold II. In 1920, it had only 1,600 inhabitants, and its population gradually increased until it reached 200,000 inhabitants in 1950. During the second half of the 20th century, the city experienced strong economic development but with anarchic urbanization: from one million inhabitants in 1970 to a population of about 17 million today. Kinshasa is separated from Brazzaville by the Congo River.

2.2   SAMPLE SIZE

The sample consisted of 105 hospitalized patients who developed stroke or those who visited these hospitals during the study period.

Table 1.   List of selected health facilities in Kinshasa

N°	Hospital name	N° of cases
1	CUK	13
2	OMECO MATETE	3
3	HOPITAL GENERAL DE REFERENCE DE KISENSO	1
4	HOPITAL ROI BAUDOUIN	1
5	HGPRK.	4
6	CLINIQUE BONDEKO	3
7	HOPITAL SINO-CONGOLAIS	2
8	HOPITAL DE NDJILI Q7	2
9	CENTRE DE REEDUCATION POUR HANDICAPES PHYSIQUE (CRHP)	72
10	CENTRE NGANDA	2
11	HOPITAL GENERAL DE REFERENCE DE KINTAMBO	1
12	CLINIQUE NGALIEMA	1
GENERAL TOTAL		**105**

2.3   DATA PROCESSING AND ANALYSIS

Data were processed and analyzed using EPIDATA 3.1 and SPSS for Windows version 20 software. Student's t-test, at the significance level of $\alpha = 0.05$, was used for comparison of means.

3   RESULTS

3.1   SOCIODEMOGRAPHIC CHARACTERISTICS OF STROKE PATIENTS

The sociodemographic characteristics of the stroke patients, studied by sex, are described in the following Table 2.

Table 2. Sociodemographic Characteristics of Stroke Patients by Gender

VARIABLES	%	GENDER		p
		Male	Female	
	105 (100%)	64 (61%)	41 (39%)	
Average age (years)	59±11,7	58,38±11,76	62,41±11,19	0,997
Age group at risk (years)				
Risk group 1				
Less than 55 years old	35 (33,3)	26 (36,2)	9 (30,4)	
At least 55 years old	70 (66,7)	38 (24,7)	32 (8,6)	0,048
Risk group 2				
Under 65 years of age	73 (69,5)	46 (17,2)	27 (13,3)	0,513
At least 65 years old	32 (30,5)	18 (43,8)	14 (25,7)	0,022
School attendance				
Yes	94 (89,5)	61 (58,1)	33 (31,4)	
No	11 (10,5)	3 (2,9)	8 (7,6)	
Level of education				
Primary	11 (11,7)	2 (2,1)	9 (9,6)	0,372
Secondary	52 (55,3)	31 (33,0)	21 (22,3)	0,629
Higher	31 (33,0)	28 (29,8)	3 (3,2)	0,273
Profession				
Public sector worker	43 (41,0)	35 (33,3)	8 (7,6)	0,779
Housewife	17 (16,2)	0 (0,0)	17 (16,2)	0,165
Private sector worker	14 (13,3)	12 (11,4)	2 (1,9)	0,167
Unemployed	12 (11,4)	2 (1,9)	10 (9,5)	0,511
Informal worker	11 (10,5)	8 (7,6)	3 (2,9)	0,999
Retired	8 (7,6)	7 (6,7)	1 (1,0)	0,998
Marital status				
Single	5 (4,8)	2 (1,9)	3 (2,9)	0,755
Married monogamous	81 (77,1)	60 (57,1)	21 (20,0)	0,672
Married polygamous	0 (0,0)	0 (0,0)	0 (0,0)	0,441
Divorced	2 (1,9)	1 (1,0)	1 (1,0)	1,00
Separated	1 (1,0)	0 (0,0)	1 (1,0)	0,998
Widowed	16 (15,2)	1 (1,0)	15 (14,3)	
Religion of the respondent				
Catholic	47 (44,8)	29 (27,6)	18 (17,1)	0,960
Revival Church	32 (30,5)	19 (29,7)	13 (31,7)	0,333
Protestant	17 (16,2)	12 (11,4)	5 (4,8)	1,00
Kimbanguiste	2 (1,9)	1 (1,0)	1 (1,0)	1,00

This table shows that out of a sample of 105 patients surveyed, 60.0% were male with a sex ratio of 1.77 men to one woman. The age of the patients ranged from 29 to 98 years, with an average of 59 ± 11.7 years old and predominantly male. The majority of patients had attended school with males strongly represented. More than half of the patients (55%) had reached secondary school level. A large proportion of the patients (41%) were workers in the public sector, 13% in the private sector and about 8% were retired. The majority of the respondents were monogamous married people and 15% were widowers.

3.2 ECONOMIC CHARACTERISTICS OF STROKE PATIENTS

Table 3 presents the economic characteristics of the stroke patients studied by gender.

Table 3. Economic characteristics of the stroke patients studied by gender

| VARIABLES | Total | GENDER | | p |
| | | Male | Female | |
	105 (100%)	64 (61%)	41 (39%)	
Household size				
1-3 people	16 (15,2)	13 (12,4)	3 (2,9)	
4-7 people	56 (53,3)	30 (28,6)	26 (24,8)	
>7+ people	33 (31,5)	21 (20,0)	12 (11,4)	
Average household size	6,0	3,7	2,4	
Occupancy status in the parcel				
Owner	65 (61,9)	39 (37,1)	26 (24,8)	0,843
Renter	35 (33,3)	24 (22,9)	11 (10,5)	0,559
Housed by employer	4 (3,8)	1 (1,0)	3 (2,9)	1,000
Housed by a relative	1 (1,0)	0 (0,0)	1 (1,0)	
Relationship to head of household				
Head of household	71 (67,8)	58 (55,2)	13 (12,5)	0,999
Spouse of head of household	15 (14,3)	0 (0,0)	15 (14,3)	1,000
Son/daughter of head of household	1 (1,0)	0 (0,0)	1 (1,0)	0,999
Brother/sister of household head	6 (5,7)	1 (1,0)	5 (4,8)	0,100
Parent of head of household	11 (10,5)	5 (4,8)	6 (5,7)	0,999
Sister-in-law	1 (1,0)	0 (0,0)	1 (1,0)	1,00
Socio-economic level				
Low	52 (49,5)	30 (28,6)	22 (21,0)	
High	53 (55,5)	34 (32,4)	19 (18,1)	
Dependents				
Yes	75 (71,4)	57 (54,3)	18 (17,1)	
No	30 (28,6)	7 (6,7)	23 (21,9)	
Number of dependents				
1 to 3 persons	26 (34,7)	21 (28)	5 (6,7)	
4 to 7 persons	36 (48)	25 (33,3)	11 (14,7)	
> 7 persons	13 (17,3)	11 (14,7)	2 (2,7)	
Main source of household income				
Salary of the head of the household	28 (26,7)	23 (21,9)	5 (4,8)	0,865
Other income of single head of household	29 (27,6)	19 (18,1)	10 (9,5)	0,391
Other income of single head of household supplemented by income of other household member	42 (40,0)	20 (19,0)	22 (21,0)	0,579
Child support	6 (5,7)	2 (1,9)	4 (3,8)	1,000

Table 3 shows that the size of households ranges from 4 to 7 persons with an average of 6 persons. Nearly 62% of them are owners and more than 30% are renters. About 68% were responsible for the household, with men representing the largest proportion. Nearly half of the patients (49.5%), had a low socioeconomic level (i.e., per capita daily expenditure on food greater than $1.25). About 71% of the patients, had reported having dependents with about 48% of the households comprising more than 4-7 people. Men were more

concerned with this responsibility. Four out of 10 patients said that their income came from the salary and other income of the head of the household, supplemented by that of another household member. Nearly half of the respondents were of the Catholic religion, followed by those of the revivalist and Protestant churches. Approximately 60% of men spent more than 40% of women.

3.3   STROKE RISK FACTORS

3.3.1   NON-MODIFIABLE RISK FACTORS FOR STROKE

The results of this study show that the non-modifiable risk factors for stroke among the patients surveyed are sex, age, and family history. The majority were men over 55 years of age and some women 65 years of age and older. Table 4 shows the percentage of family history of stroke.

Table 4.   Percentage of Family History of Stroke

Family history	Staff n (%)
Hypertension	57 (51,8)
Diabetes	27 (24,5)
STROKE	26 (23,6)
Total	**110 (100,0)**

Table 4 shows that almost half of the patients (51.8), had family members who suffered from hypertension followed by 25% of diabetes and finally 24% of stroke.

3.3.2   MODIFIABLE CARDIOVASCULAR RISK FACTORS

Modifiable risk factors include excessive tobacco and alcohol consumption, low fruit and vegetable consumption, and vegetable oil consumption.

The study revealed that approximately 29% of the patients reported having smoked tobacco in the past, of which 27% were men and only 2% were women. The subjects surveyed started smoking at a mean age of 20 ± 5 years with a mean of 18.8 ± 0.58 years composed of men. About 15% of the patients claimed to use smokeless tobacco, of which men occupy a significant proportion. Regarding the use of smokeless tobacco, 33% of the patients used chewing tobacco and 67% used snuff. Chewing tobacco was used only by women and snuff by about 44% of men and 22% of women.

Overall, 74% of the respondents, mostly men, said they had used snuff. Nearly half of the patients, predominantly male, confirmed that they had consumed beer in the last 12 months. Lager, followed by dark beer, was the most consumed beverage. About 80% of the patients had consumed more than 2 glasses of alcohol per day.

Almost all the patients said that they had consumed less fruit during their meals, with 14% of them at every meal, about 17% at every day, of which women were in large proportion. The majority of the patients, 34%, said they consumed vegetables three times a week and 26% said they consumed them every day. Almost all the patients said that they used vegetable oil in their daily diet.

3.3.3   INTERMEDIATE RISK FACTORS FOR STROKE

Intermediate risk factors were lack of physical activity, high blood pressure, diabetes mellitus, and abdominal obesity.

Lack of physical activity or a sedentary lifestyle is a serious risk factor for stroke. Approximately 63% of patients did not engage in physical activity resulting in mild shortness of breath compared with 15% who did so daily, with the proportion of men being the highest. Nearly 5% of the patients claimed to have done weight training every day of the week, in contrast to 67% of the patients who never did it. The majority of patients exercised in gyms, the rest exercised at home with assistance.

High blood pressure (HBP) is the most important cardiovascular risk factor among patients. Approximately 81% of patients report having had hypertension before their first stroke. The overall mean age of the hypertensive patients was 60±10.97 years with 54.3±9.6 years for men and 62.9±11.2 years for women. The mean systolic and diastolic blood pressure was 193.3 and 108.7 mm Hg, respectively. Among the hypertensive patients, 80% were followed in a health facility. About 73.3% were on a diet composed of 83% salt-free diet and 9% fat-free diet. The majority of hypertensive patients were civil servants followed by housewives. On admission, only 15% of the patients had normal blood pressure, and nearly 86% of the patients claimed to have had ischemic stroke. The average length of hospitalization was 13.5±11.3 days.

Overall, 16% of patients had diabetes, with a slightly higher proportion of women (9%) than men (8%). Approximately 81% of respondents claimed to have diabetes mellitus before developing stroke. Of all diabetic patients, 88% are followed in a health facility. About 88% of patients with diabetes were on an antidiabetic diet. Overall, 89% of patients were on a sugar-free diet. Only about 1 in 4 patients (25%) admitted to having relatives who had died of stroke. Of the family members who died of stroke, parents (father/mother) were the most common with about 40%, followed by brothers/with about 35%. Similarly, about 1 in 4 people (26%) say they have a relative who has or is suffering from diabetes.

Overall, 34% of the patients were abdominally obese, with twice the proportion of women as men. The average abdominal circumference of the patients was 92.7 ± 14.2 cm. Approximately 6 out of 10 women (56%) were obese compared to 1 out of 5 men (20%).

4 DISCUSSION

4.1 ANALYSIS OF SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

This study revealed that the average age of patients overall was 59 ±11.6 years, of which 58.4 years for men and 62.4 for women. This is similar to studies conducted among diabetic patients in Bamako where the average age was 53.53 ± 11.47 years [11]. The results of this study are also close to the work done in Abidjan in 2013 with the mean age of 59 ± 14 years [12]. The results of this study indicate that the male sex is more encountered (61%) than the female sex (39%). This study also shows that the majority of patients (68%) were heads of low income households and 71% of them had dependents with 53% of households containing an average of 6 people with low socioeconomic level (49.5%) and the main source of income (40%) is mainly from the salary of the head of household. This indicates that these patients had a social burden that can be described as an important cardiovascular risk factor. These results are in harmony with data from the WHO report that stroke affects low-income populations [13].

4.2 ANALYSIS OF CARDIOVASCULAR RISK FACTORS

4.2.1 ANALYSIS OF NON-MODIFIABLE CARDIOVASCULAR RISK FACTORS

The results show that the non-modifiable risk factors in the patients surveyed concern advanced age (more than 55 years and 65 years respectively for men and women), sex (predominantly male), family history (hypertension and diabetes). The results of this study show that 16.2% of patients had already developed stroke in the past. This is similar to the results of work carried out in Abidjan [12].

4.2.2 ANALYSIS OF MODIFIABLE CARDIOVASCULAR RISK FACTORS

This study revealed that the modifiable risk factors are excessive tobacco and alcohol consumption, low consumption of fruits and vegetables, regular consumption of vegetable oil. About 17% of stroke patients are active smokers.

Nearly 5% of them said they consumed alcohol for at least 5 days in a week, 17.5% from 1 to 4 days a week and 32.5% consumed it less than once a week. These results are consistent with a study conducted in the same area [14].

It was also found that all male patients had consumed more than 2 glasses of alcohol. Studies conducted in Abidjan show a low percentage (8%) of male consumption [12]. The results of this study show that 92.3% of the patients surveyed (56% of men and 36% of women) consumed less than 4 fruits per meal per day.

About 38.8% of the patients consumed vegetables less than 4 times a week. This is similar to a study conducted in the same area [14]. In this study, it was also found that the majority of patients regularly used vegetable oil in their daily diet.

4.2.3 ANALYSIS OF INTERMEDIATE CARDIOVASCULAR RISK FACTORS

The intermediate risk factors for stroke observed in the patients surveyed were mainly hypertension, diabetes mellitus, and abdominal obesity.

Approximately 86.3% of the patients surveyed presented with ischemic type stroke versus 13.7% with hemorrhagic type stroke. This is in contrast to the results of a similar study showing that the proportion of patients suffering from stroke is 47.2% for the ischemic type and 52.8% for the hemorrhagic type [15]. This difference would be due to the difference in the type of clinical diagnosis or imaging. One study found 66% of patients with stroke of the ischemic type and 34% of the hemorrhagic type [12]. This difference could be explained by the fact that they used imaging data rather than clinical data. These results are similar to those found in Mali with 22.8% of the representativeness of men [16].

In this study, it was found that 82% of the patients with stroke were hypertensive. This is in agreement with the results reported by several studies [14], [17], [18]. Hypertension was observed in unemployed civil servants (34.3%), housewives (13.3%), private sector workers (10.5%), unemployed (10.5%), informal workers (7.6%), and retirees (5.7%). This indicates that working and family life conditions could explain the high prevalence of hypertension. One study showed a prevalence of hypertension of 35.5% among low-income people [19], [20].

The proportion of patients with diabetes in this study was 16%. These results are similar to another study conducted in the city of Kinshasa [14].

This study found that 34% of the patients had abdominal obesity. This situation can be justified by aging populations and lifestyle changes (diet, urbanization, and reduced physical activity).

5   CONCLUSION

The present study has shown that stroke remains a major risk in the Kinshasa population in general and in patients with cardiovascular risk factors. The major reason is the low socioeconomic level of the population. To this effect, the frequency of hypertension and alcohol among patients remains very high, fruit and vegetable consumption is very low and the practice of physical activity also remains very low. Therefore, adequate management of cardiovascular risk factors through primary and/or secondary prevention is very important to reduce the hospital and community incidence of stroke and all the possible consequences of this disease.

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