

# Recognition of Warning Signs by the Patient with Ischemic Stroke and Impact on Emergency Department Admission Times

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## Abstract

The general objective of this study was to assess the impact of the recognition of warning signs of ischemic stroke, on the reduction of emergency admission times and the improvement of the prognosis of the patient suffering from ischemic stroke in the emergency department of the Yaounde central hospital. **Methods:** This was a prospective study with a descriptive and analytical aim carried out in the medical emergency department of the central hospital of Yaounde over a period of 3 months, going from October to December 2020. All patients admitted to emergency department, during this period, for a diagnosis of ischemic stroke confirmed by a brain CT scan were included in the study. The data was collected on a survey sheet divided into 3 sections: the patient, the assessment of his knowledge and his reaction to the stroke. The variables studied were socio-demographic data, cardiovascular risk factors and warning signs of stroke. Data analysis was conducted with Census and Survey Processing System (CSPRO). **Results:** During the study period, 62 patients met the inclusion criteria. Adults under 50 (41.94%) were the most represented age group. The mean age of the patients was 52.3 years with ranges ranging from 36 to 82 years. The sex ratio was 1.38 in favor of women. The most common unmodifiable cardiovascular risk factor was age over 55 years 44%. High blood pressure 61% was the most common modifiable risk factor. More than half of the study population had no knowledge of

the warning signs of ischemic stroke. The most well-known warning sign was 40% mouth deformation. The anamnesis noted that the weakness of the hemibody, the limb or the leg was found in our cohort in 77% of cases, followed by balance disorder (73%) and speech disorder (50%). The main associated sign was asthenia 32%. Direct admission to hospital through the emergency department was the first call for alert 58%, followed by self-medication 32% and seeking help from a family member 31%. The emergency department admission time was over 4 hours 30 minutes in more than half of the cases. **Conclusion:** Ischemic stroke is an important cause of death in sub-Saharan Africa in the acute phase. Information, education and communication about the warning signs of ischemic stroke reduce the time to emergency room visits and improve the prognosis of these patients.

## Keywords

Warning Signs, Ischemic Stroke, Emergencies

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## 1. Introduction

Stroke is a major public health problem due to its frequency, its severity and the cost of care for the poor populations of sub-Saharan Africa. This is a sudden neurological deficit of suspected vascular origin [1] [2]. There are two types of stroke, ischemic and hemorrhagic. Ischemic stroke is the most common type in emergency departments, accounting for 80% of cerebrovascular disease [1] [3]. Recent epidemiological data reveal the gravity of the situation in sub-Saharan Africa. Stroke is the leading cause of acquired disability in adults [1] [4] [5]. Based on available world health organisation (WHO) data, the annual number of strokes worldwide will drop from 16 million in 2005 to 23 million by 2030, due to the aging of the population [6] [7]. In 2005, the number of stroke survivors was 62 million [7]. It will probably reach 77 million in 10 years [7]. Prevention remains the best approach to reduce the incidence and consequences of stroke. The early diagnosis and treatment of risk factors are the main elements of this prevention. In the acute phase, every minute is capital as illustrated by the Anglo-Saxon saying “time is brain”. Stroke management is early and effective when the victims or those around the patient are able to recognize the warning signs. The shorter the treatment times, the lower the risk of mortality and disability. The treatment pathway for stroke in sub-Saharan Africa is still embryonic due to socio-cultural, financial, and organizational barriers. The general objective of this study was to evaluate the impact of the recognition of warning signs on the reduction of the delays of admission to the emergency department and the improvement of the prognosis of the patient suffering from ischemic stroke (IS) in the emergency room of the Yaounde central hospital.

## 2. Material and Methods

This was a prospective study with a descriptive and analytical aim carried out in

the medical emergency department of the central hospital of Yaounde-Cameroon over a period of 3 months, from October to December 2020. After approval by the ethics committee institution of research for human health of the catholic university of central Africa, all patients admitted to the emergency department during the above period, for a diagnosis of ischemic stroke confirmed by cerebral computed tomography were included in the study. The data was collected on a survey sheet divided into 3 sections: the patient, the assessment of his knowledge and his reaction to the stroke. The “patient” part made it possible to collect socio-demographic data. The knowledge assessment part included 3 questions. The first assessed knowledge of the warning signs of stroke. The expected signs were those of the French awareness campaigns based on the acronym FAST (facial paralysis, numbness or paralysis of an arm and/or a leg, dysarthria or disturbance of comprehension). The 2nd and 3rd question allowed the participants to question the recognition of stroke and to assess the notion of urgency perceived by the patient. Each questionnaire was anonymous. The initial collection was carried out on paper before coding the responses in an Excel spreadsheet. The variables studied were socio-demographic data, cardiovascular risk factors and warning signs of stroke. Data collected during the study period was analyzed by CSPRO software.

### 3. Results

#### 3.1. Socio-Demographic Characteristics of the Study Population

During the study period, 62 patients met the inclusion criteria out of a total of 2720 emergency medical admissions at the Yaounde-Cameroon central hospital, or 2.3%. Young adults under 50 (41.94%) were the most common age group (**Table 1**). The average age was 52.3 years with extremes ranging from 36 to 82 years. The sex ratio was 1.38 in favor of women (**Table 1**). The most common non-modifiable risk factor (**Table 2**) in the study population was age over 55 years (44%), followed by family history of stroke 37% (n = 23). High blood

**Table 1.** Distribution of the population by age group and gender.

| Age group<br>in years | Gender        |                  |               |                  | Total           |
|-----------------------|---------------|------------------|---------------|------------------|-----------------|
|                       | Male          |                  | Female        |                  |                 |
|                       | Number<br>(n) | Frequency<br>(%) | Number<br>(n) | Frequency<br>(%) |                 |
| ≤50                   | 19            | 30.65            | 7             | 11.29            | 41.94% (n = 26) |
| 51 to 60              | 8             | 12.90            | 8             | 12.90            | 25.8% (n = 16)  |
| 61 to 70              | 6             | 9.68             | 10            | 16.13            | 25.81% (n = 16) |
| 71 to 80              | 2             | 3.23             | 2             | 1.61             | 4.84% (n = 4)   |
| >80                   | 1             | 1.61             | 0             | 0.00             | 1.61% (n = 1)   |
| Total                 | 36            | 58.07            | 27            | 41.93            | 100% (n = 62)   |

**Table 2.** Distribution of the population according to cardiovascular risk factors.

| Risk factor                | Number (n) | Frequency (%) |
|----------------------------|------------|---------------|
| Microcrystalline arthritis | 1          | 1.61          |
| Viral hepatitis            | 1          | 1.61          |
| Sickle cell disease        | 1          | 1.61          |
| Pregnancy                  | 1          | 1.61          |
| HIV/AIDS                   | 3          | 4.84          |
| Diabetes                   | 8          | 12.90         |
| Sport                      | 12         | 19.35         |
| Tobacco                    | 13         | 20.96         |
| Obesity                    | 17         | 27.41         |
| Alcohol                    | 21         | 33.87         |
| Family history of stroke   | 23         | 37.09         |
| Age $\geq$ 55 years        | 27         | 43.54         |
| Arterial hypertension      | 38         | 61.29         |

pressure 61% (n = 38) and alcohol consumption 34% (n = 21) were the most common modifiable risk factors. A small proportion (15%) of the sample had a history of stroke.

### 3.2. Knowledge of Cardiovascular Risk Factors

The majority of participants 96.6% (n = 58) did not consider themselves to be at risk for stroke compared to 3.4 (n = 4) who said they were aware of this risk.

### 3.3. Recognition of Warning Signs

More than half of the study population, 85% (n = 53), had no knowledge of the concept of the warning sign of stroke and a proportion of 15% (n = 9) declared to know them (Table 3). In the cohort of patients who had knowledge of the concept of warning signs, the most recognized sign that could suggest the diagnosis of stroke was weakness on one side of the body 44%, deformation of the mouth 40% and speech disorder 8% (Table 4). The clinical examination revealed weakness of the hemibody, limb or leg in 77% of cases, a balance disorder in 73% of cases and a speech disorder in half of the cases (Table 5). Asthenia was the main symptom associated with warning signs (32%), followed by headache (11%). In our study, 10 patients (16.13%) recognized the stroke in front of the signs they presented, compared to 52 patients (83.87) who did not recognize their stroke.

### 3.4. Reaction at the Time of the Stroke

Following the symptoms presented, 36 patients (58%) considered it to be an

**Table 3.** Distribution of patients according to knowledge of warning signs.

| Warning sign known in theory by the population | Number (n) | Frequency (%) |
|--|------------|---------------|
| Mouth deviation                                | 25         | 40.32         |
| Hemiplegia                                     | 17         | 27.41         |
| Hemiparesis                                    | 5          | 8.06          |
| Aphasia  | 5          | 8.06          |
| Monoplegia                                     | 5          | 8.06          |
| Loss of balance                                | 3          | 4.83          |
| Dysarthria                                     | 3          | 4.83          |

**Table 4.** Distribution of warning signs in the study population.

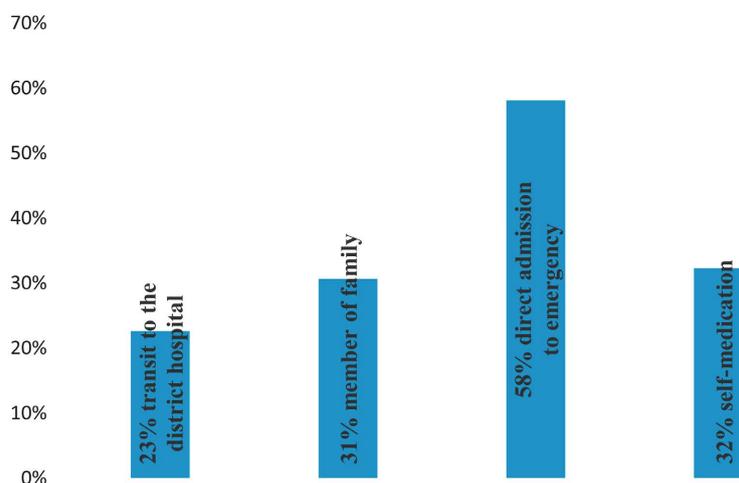
| Warning signs found           | Number (n) | Frequency (%) |
|-------------------------------|------------|---------------|
| Inability to lift a limb      | 48         | 77.41         |
| Loss of balance               | 45         | 72.58         |
| Disathria (changes in speech) | 31         | 50            |
| Facial paralysis              | 24         | 38.70         |
| Blurred vision                | 5          | 8.06          |

**Table 5.** Main symptoms associated with warning signs in the study population.

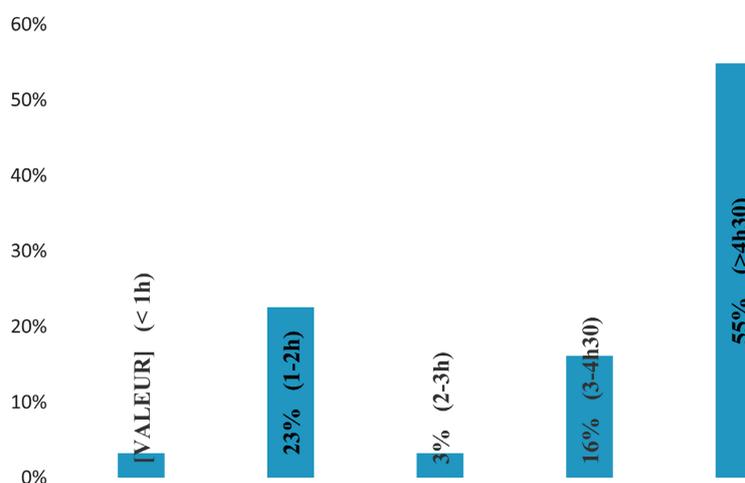
| Associated signs with warning signs | Number (n) | Frequency (%) |
|-------------------------------------|------------|---------------|
| Headache                            | 7          | 11.29         |
| Fever                               | 4          | 6.45          |
| Asthenia                            | 20         | 32.25         |
| hypersialorrhea                     | 2          | 3.22          |
| Dysphagia                           | 1          | 1.61          |
| Vomiting                            | 2          | 3.22          |
| Convulsions                         | 4          | 6.45          |

emergency situation, with the need to give the alert quickly. Direct admission to hospital via the emergency department was the first alert 58%, followed by self-medication 32% and seeking help from a family member 31% (**Figure 1**). The time to admission to the emergency department was over 4 hours 30 minutes in more than half of the cases 58% (**Figure 2**). Admission to hospital was by unsafe transport in all cases. No aid or care was provided in the pre-hospital phase. The death rate from ischemic stroke in the emergency department of the Yaounde central hospital was 10%.

A small proportion of 7 patients, reported having been sensitized to stroke by a health worker.



**Figure 1.** Distribution of patients according to the alert appeal.



**Figure 2.** Distribution of the study population according to emergency department admission time.

#### 4. Discussion

In our cohort, ischemic stroke occurred in a relatively young, predominantly female population. The same tendency was found by Octave Houannou and all [8]. In their work on the prognosis of stroke in the acute phase, carried out at the national university hospital of Cotonou in 2018, the authors determined the average age of stroke at 60 years. The production of Cameroon's 2016 Analytical Health Profile made it possible to compile data and information relating to the health of populations in a single document and to put in place useful evidence for decision-making. This profile analytically describes the updated health situation in Cameroon. Our results could be partially explained by the distribution of the population by age and sex in Cameroon. The age pyramid shows a broad base and a narrowed top. This triangle shape is characteristic of young populations with a high fertility rate and high mortality. In the Cameroonian population, the age group of 0 - 24 years represents 62.5% of the total population [8].

Health policies should focus on this target as a priority to reap the benefits of the demographic dividend. The population aged 60 and over is only 6.4% [8].

In our study, 85% of those surveyed did not know any warning signs of stroke compared to 15% who said they did. The majority of the workforce, 96.6% (n = 58) did not consider themselves to be at risk for stroke compared with 3.4% (n = 4) who said they were aware of this risk. The symptoms of stroke depend on the area of the brain affected and the extent of the injury. The expected signs at the end of our interrogation were those resulting from awareness campaigns about stroke among the French public, and derived from the acronym FAST (Face-Arm-Speech-Time) [9]. Derex *et al.* found in a work carried out in 2004 on the evaluation of the level of information concerning the cerebrovascular accident of the patients admitted in a French neurovascular unit that 42% of the patients questioned recognized no warning sign against 58% who knew at least one. Joual El Mesbahi *et al.* also demonstrated this lack of knowledge of the population in a work carried out on the evaluation of the knowledge of the population on the risk factors and warning signs of cerebral infarction in Marrakech in 2017, half of those questioned had no knowledge of the concept of a warning sign [10]. Stroke requires urgent treatment, but the signs of stroke are largely unrecognized by the African populations south of the Sahara. The population must know how to recognize at least the three most common signs of stroke and urgently call for the appropriate help. Sub-Saharan Africa must take into account the level of education of its populations to adapt information and communication strategies to it. Lack of awareness of warning signs is strongly correlated with low stroke recognition rate, the reverse proposition is not the absolute truth. This low rate of recognition of stroke (16.13%) in our work testifies to the urgency of implementing mass communication strategies for the benefit of this population. This low stroke recognition rate is also seen in many publications. The work of Derex *et al.* is the perfect illustration [11] [12]. In our work environment, awareness campaigns are usually limited to activities on October 29 of each year, World Stroke Day. We recommend that these activities be extended throughout the year by exploiting new digital communication channels.

In the absence of a dedicated conventional stroke pathway in Cameroon, it is not obvious from our study to determine which one is giving the alert. But it is clear that the first alert was direct admission to the emergency department of Yaounde central hospital by non-medical transport for all cases. The time between the onset of symptoms and the first alert or reaction time was in the majority of cases more than 4 hours 30 minutes. These emergency hospital admission delays excluded the possibility of recovery of the ischemic penumbra area in patients eligible for thrombolysis. In the work of Nadia Richard [13], 35% of the people questioned called their attending physician, 27% called the toll-free number of the emergency center then 16% the fire brigade, 11% did not alert anyone and 10% alerted a relative. The attending physician remains the most alerted person in the event of a stroke, in many other series [11] [14] [15]. Referral in the first place was associated with longer pre-hospital delays [11] [15].

The stroke-related mortality in the medical emergency department of the Yaoundé central hospital is 10%. This rate could be lowered if the prospects for improving the treatment pathway for stroke are considered.

## 5. Conclusion

Ischemic stroke is the result of blockage of a cerebral artery by a blood clot or by a fatty deposit caused by atherosclerosis. Symptoms appear suddenly and may include muscle weakness, paralysis, abnormal sensation or lack of sensation on one side of the body, slurred speech, confusion, blurred vision, dizziness, and loss of balance and coordination. Diagnosis is usually based on symptoms presented, physical examination and brain imaging data. The patient's prognosis is greatly dependent on the precocity of the initial treatment. Our study shows that the Cameroonian population has insufficient knowledge about the warning signs of stroke. The 3/4 of the study population have an inappropriate reaction to the onset of stroke, justifying the late admission to the emergency department and consequently the worsening of their prognosis. There is an urgent need to create a dedicated chain for the management of stroke with a view to optimizing the care of patients with stroke. It also seems wise to initiate awareness campaigns with a method of disseminating information adapted to local communities.

## Limitation of Study

The main limitation of the study was the monocentric nature and the small sample size.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## Authors' Contribution

All authors have read and approved the final version of the manuscript.

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