



## Review Article

## Ischemic stroke due to embolic heart diseases and associated factors in Benin hospital setting



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## ABSTRACT

**Introduction:** Poor access to cardiovascular checkups is a major cause of ignorance of embolic heart diseases as the etiology for ischemic stroke.

**Objective:** Study ischemic strokes due to embolic heart diseases and their associated factors.

**Method:** It was a cross-sectional, prospective, descriptive and analytical study conducted from November 1, 2014 to August 31, 2015 on 104 patients with ischemic stroke confirmed through brain imaging. Embolic heart diseases included arrhythmia due to atrial fibrillation (AF), atrial flutter, myocardial infarction (MI), heart valve diseases and atrial septal aneurysm (ASA). The dependent variable was embolic heart disease while independent variables encompassed socio-demographic factors, patients' history, and lifestyle. Data analysis was carried out through SAS 9.3.

**Results:** The rate of embolic heart diseases (EHD) as etiology for ischemic stroke was 26% (28/104). AF accounted for 69% of embolic heart diseases and 22.8% of etiologies for ischemic stroke. Ischemic strokes prevalence was 3.5%, 2.5% and 1.2% respectively for heart valve diseases, MI and ASA. The associated factor was age ( $p = 0.000$ ).

**Conclusion:** The diagnosis of a potential cardiac source of embolism is essential because of therapeutic and prognostic implications. Wherefore, there is need for cardiovascular examination particularly Holter ECG and cardiac ultrasound examination which are not always accessible to our populations.

## 1. Introduction

As in developed countries, stroke is the third cause of mortality in sub-Saharan Africa [1]. With 29% as estimated rate of mortality [2], stroke leads to functional disability in 69% of cases [3]. Among ischemic type of strokes, 20% are associated with embolism of cardiac origin and are accessible to effective prevention through early diagnosis of cardiac anomaly [4]. In sub-Saharan Africa, technical and financial accessibility is a major obstacle to the diagnosis of embolic heart diseases. In fact, the costs of check-ups required in the process of locating cardioembolic causes were fully borne by the authors stymied by high frequency of stroke recurrence within the Neurology University Clinic. This was specific to low socio-economic segment of the population. Given this unfortunate situation, and keen to understand stroke etiologies, the authors have committed to carry out this study, the first ever of its kind in Benin. The purpose is to draw our politico-administrative

authorities' attention on the importance of etiological assessment in stroke management in order to leverage resources which will systematically enable these assessments to facilitate background therapy which could improve the vital prognosis of these patients. This study was initiated to determine the proportion of embolic heart diseases in the occurrence of ischemic stroke in Benin hospital setting.

## 2. Framework and methodology

## 2.1. Framework of the study

The study was conducted at the Department of Neurology of CNHU-HKM Cotonou.

It is Benin referral hospital positioned at the central level in the health pyramid. It is based in a city of 600,000 inhabitants. In this hospital, the Emergency Department, Intensive Care Unit, Cardiology

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and Neurology Departments take care of stroke cases. To date, CNHU-HKM Cotonou has neither neurovascular unit nor neurovascular specialist. This study was self-financed by the authors, in a developing country with technical facilities and health policy far behind those of developed countries. In Benin, healthcare and healthcare services are directly paid by the client and most of the time healthcare is provided after payment. Based on the above, the difficulties in realizing this study are obvious.

## 2.2. Methodology

### 2.2.1. Patients

This study took place from 1st November 2014 to 31st August 2015. It was a cross-sectional, prospective, descriptive and analytical study on all ischemic stroke patients seen during the study period. Individuals included in the study were stroke patients who gave their informed consent (or otherwise consent from a close relative) to participate in the study and whose ischemia was confirmed through cerebral CT scan or magnetic resonance imaging.

### 2.2.2. Diagnosis of cardioembolic heart diseases

Embolitic heart diseases were selected on the basis of cardiac para-clinical tests namely ECG, Holter ECG and transthoracic echocardiogram. The electrical anomalies tested were cardiac rhythm disorders such as arrhythmia due to atrial fibrillation (AF), atrial flutter and myocardial infarction. Ischemic heart diseases included in the study are those preceding stroke within < 4 weeks. The transthoracic echocardiogram sought heart valve diseases (mitral valve stenosis, calcified aortic stenosis...), hypertrophic cardiomyopathies, myocardial infarction, patent foramen ovale (PFO) and atrial septal aneurysm (ASA). Heart diseases were selected based on TOAST classification [5] (Table 1).

### 2.2.3. Statistical analysis

The dependent variable was embolic heart disease while the independent variables encompassed socio-demographic factors (age, gender, marital status, level of education, place of residence), vascular risk factors (HBP, diabetes, obesity, physical inactivity, alcohol and tobacco consumption). Data analysis was conducted through *Statistical Analysis Software (SAS)* version 9.3 and Excel 2013. Quantitative variables were expressed in average with their standard deviation, confidence interval estimated at 95% while the comparison of proportions was made using Pearson's chi square statistical test with p below 0.05 as a significance threshold. For the purpose of identifying associated factors, we first conducted a bivariate analysis. At this stage, the variables associated with embolic heart diseases were subject to a multivariate analysis for final identification of associated factors.

**Table 1**  
Classification of cardioembolic stroke according to their risk.

High risk	Moderate risk
Prosthetic mechanical valve	Mitral valve prolapse
Mitral stenosis with atrial fibrillation	Mitral annular calcification
Atrial thrombus	Mitral stenosis with no atrial fibrillation
Sick sinus syndrome	Calcified aortic stenosis
Recent myocardial infarction (< 4 weeks)	Inter-atrial septal aneurysm
Left ventricle thrombus	Patent foramen oval
Atrial myxoma	Non-bacterial endocarditis
Infectious endocarditis	Left atrial spontaneous echo contrast

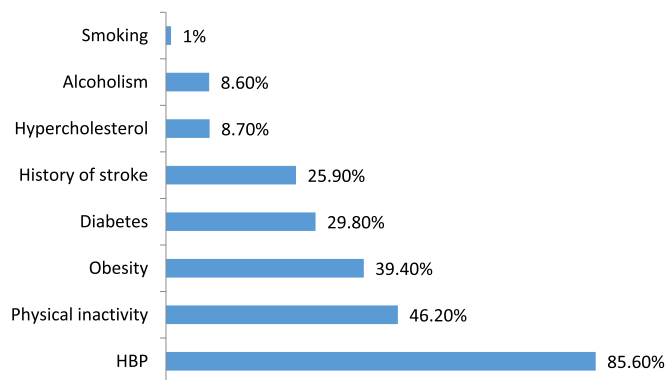


Fig. 1. Frequency of vascular risk factors.

## 3. Results

### 3.1. Frequency

175 stroke patients were seen during the study period. We recorded respectively 104 and 71 cases of ischemic and hemorrhagic stroke representing 59.4% and 40.6% frequency.

### 3.2. Socio-demographic and clinical characteristics

The average age of the 104 ischemic stroke patients was 61.9 years ± 12.3 [26–87 years]. Sex-ratio (M/F) was 1.6. Fig. 1 shows the frequency of vascular risk factors in ischemic stroke patients. On average, the patients waited for 64.94 h (± 96.12) with extremes values of 1 to 456 h before reporting to the referral hospital. Clinically, 18.9% developed impaired consciousness, 29.8% aphasia and 57.5% hemiplegia.

### 3.3. Paraclinical assessment

Based on brain imaging, 75% of the lesions observed are located in the carotid territory and 25% account for vertebrobasilar lesions.

The rate of ECG completion was 91.3% (95/104) with 15.8% cases of embolic heart disease. The rate of Holter-ECG completion was 75.9% (79/104) with 25.3% cases of embolic heart disease. Systematic Holter ECG made it possible to diagnose 5 additional cases of paroxysmal atrial fibrillation in patients who previously had normal ECG.

81.7% (85/104) of the patients whose results are presented in Table 2, carried out transthoracic cardiac ultrasound.

Among heart valve diseases diagnosed through cardiac ultrasound, there was one case of mitral valve stenosis and two cases of calcified aortic stenosis.

### 3.4. Embolic heart disease

Out of the total 104 ischemic stroke patients, 26 (25%) developed

**Table 2**  
Patients distribution based on transthoracic cardiac ultrasound.

	Number (n)	Percentage (%)
Normal	79	92.9
Heart valve disorders	3	3.5
Ischemic heart disease <sup>a</sup>	2	2.4
Aneurysm <sup>b</sup>	1	1.2
Total	85	100

<sup>a</sup> Ischemic heart disease with impairment of the function of ventricular systolic ejection.

<sup>b</sup> Inter-atrial septal aneurysm and apical aneurysm of the right ventricle.

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