

An Analysis of Epidemiological and Etiological Aspects of Cerebrovascular Events

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Abstract: Cerebrovascular stroke is a major public health concern, with ischemic strokes being the most prevalent and cardioembolic origins playing a significant role. This study aimed to determine the in-hospital prevalence of cardiovascular disease in patients with ischemic stroke and evaluate the diagnostic and therapeutic impact of complementary examinations. Conducted over a 2-year period (June 2022 - May 2024) at a private hospital, the retrospective study included 300 cases of ischemic stroke admitted to the cardiology and neurology departments. Routine diagnostic tests such as ECG, transthoracic echocardiography (TTE), and Doppler ultrasound of the neck vessels were utilized, with transesophageal echocardiography (TEE) and Holter ECG performed selectively. A significant majority, 80%, had at least one cardiovascular risk factor, and 7.6% had a history of hypokinetic cardiomyopathy in its dilated stage. The average time to consultation was 26 hours, indicating that 65% of patients had scores below 10, 21% had scores between 10 and 20, and 14% had scores above 20. Abnormal ECGs were found in 67.6% of cases, and TTE revealed abnormalities in 63%, primarily left atrial dilation. TEE, conducted in 8% of cases, identified several significant findings, including inter atrial aneurysm with patent foramen ovale, left atrial thrombus, one left atrial myxoma, mitral valve wing block, and complex aortic atheroma. Holter ECG detected atrial fibrillation in 27 cases. These results underscore that ischemic stroke etiologies are predominantly lacunar infarctions and cardioembolic heart disease, with atherosclerosis also notable. Effective management relies on early diagnosis and thorough etiological assessment to improve patient outcomes and address cryptogenic strokes.

Keywords: Ischemic stroke, cardioembolic etiology, cardiovascular disease, diagnostic examinations, Holter ECG, TEE, TTE.

1. Introduction

Cerebrovascular stroke, a major public health issue, is characterized by sudden disruptions in blood flow to the brain, leading to significant morbidity and mortality. Ischemic stroke, the most common type, accounts for a substantial proportion of these cases, with various underlying causes contributing to its occurrence [9, 25, 39, 55, 69]. Among these causes, cardioembolic origins are particularly significant, often resulting from underlying cardiovascular diseases such as atrial fibrillation, myocardial infarction, or cardiomyopathy [6, 15, 20, 31, 53, 72, 91]. Cardiovascular disease, a prevalent risk factor, plays a crucial role in the etiology of ischemic stroke, emphasizing the need for comprehensive evaluation of cardiovascular health in affected patients [7, 12, 32, 44, 54, 63, 80]. Despite advances in diagnostic techniques, identifying the exact etiology of ischemic strokes remains challenging and critical for optimizing treatment strategies. This study aims to assess the in-hospital prevalence of cardiovascular conditions among patients with ischemic stroke and evaluate the impact of diagnostic and therapeutic interventions [4, 16, 23, 45, 52, 67, 85, 92]. By analyzing data from routine and specialized diagnostic examinations, including ECG, transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), and Holter ECG, we seek to understand the role of cardiovascular factors in stroke etiology. Ultimately, this study will provide insights into the effectiveness of these diagnostic tools in guiding treatment and improving patient outcomes in ischemic stroke management [5, 17, 27, 51, 65, 71, 86]. Stroke represents a major public health challenge, with ischemic stroke being the most prevalent type. Among the various causes of ischemic stroke, cardioembolic etiology stands out as a significant contributor [8, 18, 28, 35, 46, 57, 66, 76, 93]. This underscores the critical role of both cardiologists and neurologists in recognizing and addressing

this origin, especially when imaging results indicate potential cardiovascular involvement [2, 11, 19, 29, 40, 56, 73, 97]. Advances in stroke management have been driven by improvements in cerebral imaging techniques, the development of thrombolytic therapies, and the demonstrated benefits of high-quality care during the acute phase of stroke [3, 13, 21, 43, 64, 78, 81, 90]. Our study is designed to assess the prevalence of cardiovascular disease among stroke patients admitted to the hospital and to evaluate the impact of diagnostic and therapeutic interventions. By examining the results of various complementary tests, including those used to detect underlying cardiovascular conditions, we aim to provide insights into how these diagnostic tools influence the management and treatment outcomes of stroke patients.

2. Materials and Method

Routine diagnostic evaluations for this study included several key procedures:

Electrocardiography (ECG): This test was employed to record the electrical activity of the heart, helping to identify any abnormalities in heart rhythm or electrical conduction that could be associated with ischemic stroke [10, 24].

Transthoracic Cardiac Echocardiography (TTE): This imaging technique was used to visualize the heart's structure and function from outside the chest. It provided essential information about the heart chambers, valves, and overall cardiac performance, which is crucial for detecting potential sources of emboli [33, 47].

Doppler Echocardiography of the Neck Vessels: This specific type of echocardiography assessed blood flow within the carotid and vertebral arteries. It was instrumental in

identifying any significant narrowing or blockages that could contribute to stroke risk [14, 38].

Transesophageal Echocardiography (TEE): This procedure was utilized when a more detailed and precise view of the heart was required. By inserting a probe into the esophagus, TEE allowed for a closer examination of the heart's chambers and valves, particularly useful for identifying abnormalities that might not be visible with transthoracic echocardiography [22, 58, 77].

Holter ECG Monitoring: This test involved continuous recording of the heart's electrical activity over a 24 - hour period. It was used selectively to detect intermittent arrhythmias, such as atrial fibrillation, which might not be apparent in a standard ECG [1, 26, 41, 50].

These routine and specialized examinations collectively provided a comprehensive evaluation of patients, aiding in the diagnosis and management of ischemic stroke by identifying potential cardiovascular contributors and guiding therapeutic decisions.

3. Results and Discussion

Stroke is a major cause of illness and death globally. Ischemic strokes (AVCI) make up 80% of all stroke cases, and their frequency increases as the population ages. The precise mechanisms behind this serious condition are not entirely clear and may involve multiple factors. Four primary pathophysiological mechanisms have been identified: (1) cardioembolic, (2) hypotensive, (3) neurogenic stunned myocardium, and (4) dissection. Indicators of a cardioembolic cause include multiple strokes at different times, the presence of other systemic embolisms, and rapid

recanalization of a blocked major cerebral artery [30, 48, 62, 79]. In this study, the average age was 68.3 ± 8.9 years, which is consistent with other studies in Morocco (Fez: 65.5 ± 13.9 , military hospital in Marrakech: 66.3 ± 12.5) and France (66.3 ± 13.4 years). Identifying cardiovascular risk factors (CVRFs) is the first step in diagnosing ischemic strokes [36, 60, 75]. Our study found hypertension, diabetes, smoking, and dyslipidemia to be the main CVRFs. Hypertension (HTA) was the leading factor in 64% of cases. A meta - analysis of 17 trials involving about 50, 000 patients showed that reducing systolic blood pressure by 10 - 13 mmHg lowers stroke risk by 38%. Diabetes poses a similar risk to hypertension, with a 1.5% annual risk of ischemic stroke for diabetics [34, 59, 68]. In the study, 40% of patients had diabetes. Smoking, a primary risk factor for carotid atherosclerosis, was present in 52.3% of our patients, which is higher than rates reported. Screening for potential cardiac causes of ischemic strokes involves cardiovascular investigations such as ECG, echocardiography (ETT), carotid Doppler ultrasound, and, if needed, transesophageal echocardiography (ETO) and Holter ECG [37, 61, 74].

Table 1: Parameters

No.	Characteristic (n=300)	Percentage
1	Mean Age in years	68.3 (21 - 90)
2	Sex Ratio M/F (193/107)	1.8
3	Atrial Fibrillation 63	21
4	Mitral Stenosis (MR) 38 (12, 6)	12.6
5	Mechanical Valve Replacement 8 (2, 6)	2.6
6	Dilated Cardiomyopa 23 (7, 6)	7.6
7	HTA or Anti - HTA Treatment 192 (64)	64
8	DT or Anti - DT Treatment 124 (40)	40
9	Smoking 157 (52, 3)	52.3
10	Dyslipidemia 113 (37, 6)	37.6
11	Abdominal Obesity 73 (24, 3)	24.3

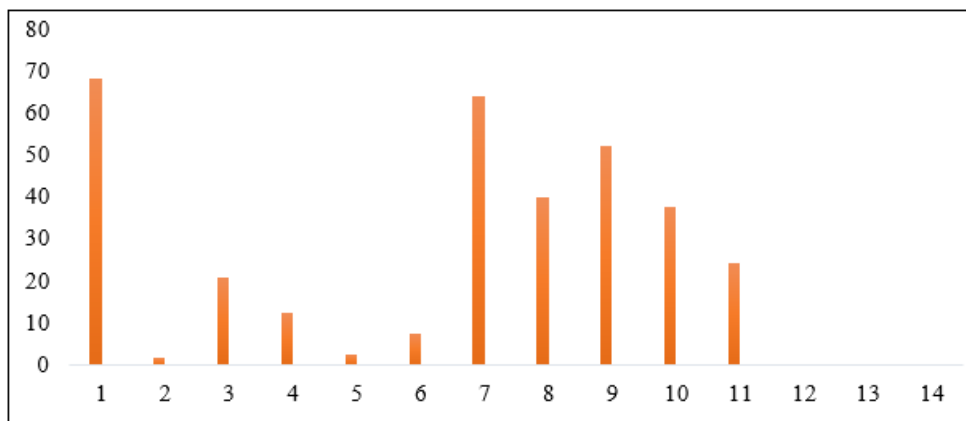


Figure 1: Representation of range of insights about the patient population

In the study, 67.6% of ECGs were abnormal, with 21% showing atrial fibrillation (AF), and an additional 17.7% detected AF during Holter monitoring. Atrial fibrillation is a known cardioembolic source, implicated in 17% to 46% of ischemic strokes. Transthoracic echocardiography (ETT) is essential for detecting embolic heart disease (CE), and when combined with transesophageal echocardiography (ETO), it can identify over 52% of CE cases [42, 70, 95]. Despite the known risk of complex aortic atheroma, only 2 cases were observed in this study, possibly due to the relatively young age of population. Stroke mortality varies, with long - term

excess mortality often linked to coronary risk. Figure (1) represented a range of insights about the patient population in this study, including demographic details, prevalence of cardiovascular conditions, and common risk factors associated with stroke. The key characteristics are:

Demographic Profile

Mean Age: The average age of the patients is 68.3 years, with an age range spanning from 21 to 90 years.

Sex Ratio: There is a notable male predominance among the patients, with a sex ratio of 1.8 (193 males to 107 females).

Cardiovascular Conditions:

Atrial Fibrillation: Present in 21% of the cases, indicating a significant proportion of patients with a known risk factor for cardioembolic stroke.

Mitral Stenosis (MR): Found in 12.6% of patients, which contributes to stroke risk due to potential embolic complications.

Mechanical Valve Replacement (MVR): Noted in 2.6% of patients, a specific condition that may relate to previous cardiac surgeries.

Dilated Cardiomyopathy: Affecting 7.6% of the patients, a condition that can lead to increased stroke risk due to its impact on heart function.

Risk Factors and Treatments:

Hypertension (HTA) or Anti - HTA Treatment: Present in 64% of the patients, highlighting hypertension as a prevalent risk factor.

Diabetes Mellitus (DT) or Anti - DT Treatment: Affecting 40% of patients, indicating a significant prevalence of diabetes among this cohort.

Smoking: Reported in 52.3% of patients, a major modifiable risk factor for stroke.

Dyslipidemia: Present in 37.6% of the cases, contributing to atherosclerosis and stroke risk.

Abdominal Obesity: Observed in 24.3% of patients, which is associated with metabolic syndrome and increased stroke risk.

Figure (1) provides a comprehensive overview of various aspects of the patient population included in this study. It presents a detailed snapshot of the demographic characteristics, offering insights into the age, gender distribution, and other relevant population attributes [49, 82, 94, 96]. Additionally, the figure highlights the prevalence of cardiovascular conditions among the participants, shedding light on the frequency and impact of these conditions within the studied cohort. Furthermore, it delineates the common risk factors associated with stroke observed in this group, such as hypertension, diabetes, smoking, and dyslipidemia [83, 87, 98]. By integrating these elements, Figure (1) effectively encapsulates the key factors contributing to the study's findings and helps to contextualize the broader implications for understanding stroke risk within this patient population. It illustrated the demographic and clinical profile of individuals with stroke in the study [84, 88, 89]. The data highlights the importance of managing cardiovascular conditions and risk factors in stroke prevention and treatment.

4. Conclusion

Our study highlights that ischemic stroke is predominantly associated with lacunar infarctions and cardioembolic heart disease, with atherosclerosis also playing a significant role. The high prevalence of cardiovascular risk factors among patients underscores the critical need for thorough cardiovascular evaluation in stroke management. The findings emphasize the importance of using a comprehensive diagnostic approach, including routine ECG, TTE, and selective TEE and Holter ECG, to accurately identify etiological factors. Early and precise diagnosis of the underlying causes can guide effective treatment strategies and improve patient outcomes. This study reinforces the essential role of cardiologists in managing stroke patients, particularly in addressing identified cardiovascular conditions and refining therapeutic interventions to enhance prognosis and address cryptogenic strokes effectively.

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