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PREVALENCE OF PREVIOUSLY UNDIAGNOSED HEART DISEASE IN PATIENTS ADMITTED WITH ACUTE ISCHEMIC STROKE TO AN EMERGENCY HOSPITAL IN GOIÁS

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ABSTRACT

Introduction: Ischemic stroke is one of the leading causes of death worldwide, accounting for approximately 11% of all deaths. It is also a leading cause of functional disability in adults, with significant loss of autonomy and progressive cognitive decline. Several risk factors are associated with stroke, such as systemic arterial hypertension, diabetes mellitus, dyslipidemia, atrial fibrillation, and heart failure. Early detection of heart disease, especially in patients recently diagnosed with stroke, is essential for appropriate treatment and improved prognosis. However, there is a lack of studies evaluating the prevalence of previously undiagnosed heart disease in patients hospitalized for ischemic stroke. Objective: To identify the main undiagnosed heart diseases in patients hospitalized for acute ischemic stroke. **Methods:** retrospective, observational, descriptive study, analyzing the medical records of patients admitted to the Dr. Valdemiro Cruz Emergency Hospital of Goiás in July, August, September, October, November, and December 2024. Data collection included demographic information, risk factors, comorbidities, and diagnoses made during hospitalization, with an emphasis on previously unknown cardiac diseases such as arrhythmias, heart failure with reduced ejection fraction, intracavitary thrombi, moderate or severe valvular disease, and patent foramen ovale. The data were tabulated in Microsoft Excel® and presented descriptively. **Results:** During hospitalization, atrial fibrillation/flutter was observed in 14.9% of patients, Heart failure with mildly reduced or reduced ejection fraction in 12.4%, left ventricular segmental contractility abnormalities in 14.5%, and moderate or severe valve regurgitation or stenosis in 15.9% of patients. Left ventricle thrombus was also observed in 1.4% of patients and patent foramen ovale in 4.5%. **Conclusion:** In this study, we observed a high prevalence of underdiagnosed cardiac diseases in patients hospitalized due to acute ischemic stroke.

Keywords: Stroke; Early diagnosis; Cardiovascular diseases; Risk factors; Primary prevention.

INTRODUCTION

Ischemic stroke (IS) is one of the leading causes of death worldwide, accounting for approximately 11% of all deaths.[1] In Brazil, between 2019 and 2023, there were 174,626

deaths due to ischemic stroke, predominantly affecting elderly men.[2] In addition, stroke is one of the main causes of disability in adulthood. Severe or recurrent strokes can lead to cognitive decline and functional impairment.[3] Nearly half of stroke survivors require assistance with at least one basic activity of daily living six months after the event.[4]

Comorbidities such as systemic arterial hypertension, diabetes mellitus, dyslipidemia, heart failure, and arrhythmias are classically associated with the occurrence of stroke. With better adherence to prevention programs, early detection, and appropriate treatment of these risk factors, many events could be avoided.[5]

Atrial fibrillation (AF) is the most common arrhythmia in clinical practice, affecting approximately 50 million people worldwide, particularly the elderly.[6] It increases the risk of ischemic stroke by five to nine times, with a progressive increase with advancing age, and accounts for approximately 20% of cases.[7] A cross-sectional analysis of the ELSA-Brasil study showed a prevalence of atrial fibrillation of 2.5% among participants, similar to that found in other international studies. A low rate of anticoagulant use was also observed, with only 10.8% of patients with an indication receiving anticoagulation therapy. Among these, a lower tendency toward use was noted in younger patients and women.[8]

Heart failure also has a high prevalence in the general population, affecting an estimated 3 million Brazilians. Between 2008 and 2018, it was responsible for more than 2 million hospitalizations within the Brazilian Unified Health System (SUS), resulting in over 252,000 deaths.[9] Atrial fibrillation is frequently associated with heart failure and may be present in up to 50% of severe cases.[10]

Degenerative valvular heart diseases have become increasingly prevalent due to population aging. In less developed regions of Brazil, valvular diseases of rheumatic etiology remain a concern among young adults. In advanced stages, these conditions may contribute to the development of atrial fibrillation and progression to heart failure with reduced ejection fraction, increasing the risk of stroke.[11]

Early detection of heart diseases is essential for preventing severe adverse cardiovascular outcomes. The identification of previously undiagnosed atrial fibrillation after an ischemic stroke changes both therapeutic management and patient prognosis.[12] Despite the relevance of this topic, there are no studies addressing the prevalence of previously undiagnosed heart diseases in patients who experienced acute ischemic stroke.

The primary objective of this study was to identify the main previously undiagnosed heart diseases in patients hospitalized due to acute ischemic stroke.

METHODOLOGY

This is an observational, retrospective, and descriptive study, based on the analysis of electronic medical records of patients admitted to the Hospital de Urgências de Goiás due to acute ischemic stroke.

Patient identification was performed using ICD code I64 in the MVPEP/MVSOUL® electronic medical record system used by the hospital. Patients admitted to the Hospital de Urgências de Goiás in July, August, September, October, November, and December 2024 due to acute ischemic stroke, with diagnosis confirmed by imaging studies, were included in the study. Patients who did not meet criteria for ischemic stroke and those

seen only for outpatient follow-up were excluded.

Data collected from the electronic medical records were transcribed into a standardized evaluation table designed for the study. Medical records were reviewed individually, assessing diagnoses and risk factors reported by the patient or family members at admission, as well as diagnoses established after screening examinations during hospitalization, with particular focus on previously undiagnosed cardiac diseases.

To characterize the sample, personal data such as age and sex were collected, in addition to prior comorbidities and risk factors, including systemic arterial hypertension, diabetes mellitus, dyslipidemia, coronary artery disease, chronic kidney disease, atrial fibrillation/flutter, heart failure, and previous stroke. Subsequently, the medical records were reviewed again to identify cardiac diseases diagnosed during hospitalization, such as atrial fibrillation/flutter, heart failure with reduced ejection fraction, intracavitary thrombi, moderate or severe valvular heart disease, and patent foramen ovale. The collected data were then tabulated using Microsoft Excel® version 2021 and analyzed descriptively.

This study was ethically approved by the Research Ethics Committee of HUGOL (CEP-HUGOL) under opinion number CAAE: 89872425.5.0000.0237.

RESULTS

A total of 510 medical records were analyzed, of which 279 patients (54.7%) were male and 231 (45.3%) were female (Table 1). The mean age of the patients was 67.3 years, with a standard deviation of 14.2.

Table 1. Distribution of patients hospitalized with ischemic stroke from June to December 2024 according to sex, with N: total number of patients; %: percentage of total patients.

Sex	N	%
Male	279	54.7%
Female	231	45.3%

Regarding stroke etiology, the TOAST classification (Trial of ORG 10172 in Acute Stroke Treatment) was used. Forty patients (7.6%) were classified as TOAST 1 (large-artery atherosclerosis), 119 (23.3%) as TOAST 2 (cardioembolic), 5 (1.0%) as TOAST 3 (small-vessel occlusion), 12 (2.4%) as TOAST 4 (other determined cause), and 334 (65.5%) as TOAST 5 (cryptogenic) (Table 2).

Table 2. Etiological classification of ischemic strokes, with N: total number of patients; %: percentage of total patients; AVC: stroke; TOAST: Trial of ORG 10172 in Acute Stroke Treatment.

TOAST	N	%
1	40	7.6%
2	119	23.3%
3	5	1.0%
4	12	2.4%
5	334	65.5%

Table 3 shows the prevalence of diseases and risk factors previously diagnosed before hospital admission. Among the patients analyzed, 370 (72.5%) had systemic arterial hypertension, 169 (33.1%) had diabetes mellitus, 89 (17.5%) had dyslipidemia, and 27 (5.3%) had chronic kidney disease. Regarding cardiac conditions, 28 (5.5%) had atrial fibrillation or flutter, 19 (3.7%) had heart failure with reduced ejection fraction (HFrEF), and 41 (8.0%) had chronic coronary artery disease (CAD) or had undergone coronary angioplasty. Finally, 100 patients (19.6%) had a history of one or more previous strokes.

Table 3. Diseases and risk factors prior to hospitalization, with N: total number of patients; %: percentage of total patients; HFrEF: heart failure with reduced ejection fraction; CAD: coronary artery disease; PCI: percutaneous coronary intervention; Stroke: cerebrovascular accident.

Comorbidities and risk factors	N / %
Systemic arterial hypertension	370 / 72.5%
Diabetes mellitus	169 / 33.1%
Dyslipidemia	89 / 17.5%
Chronic kidney disease	27 / 5.3%
Atrial fibrillation or atrial flutter	28 / 5.5%
HFrEF	19 / 3.7%
CAD / PCI	41 / 8.0%
Previous stroke	100 / 19.6%

During hospitalization, atrial fibrillation or flutter was diagnosed in 76 (14.9%) patients, and 87 (17.1%) either did not undergo an electrocardiogram or did not have the report recorded in the medical chart. Table 4 shows the left ventricular ejection fraction of patients hospitalized with ischemic stroke. Overall, 29 (5.7%) patients were diagnosed with heart failure with mildly reduced ejection fraction (HFmrEF) and 34 (6.7%) with heart failure with reduced ejection fraction (HFrEF). Table 5 shows the echocardiographic abnormalities diagnosed during hospitalization. Segmental left ventricular wall motion abnormalities were identified in 74 (14.5%) patients, including some with preserved ejection fraction. Left ventricular thrombus was found in 7 (1.4%) patients. Regarding valvular heart disease, 81 (15.9%) patients were diagnosed with moderate or severe valvular regurgitation or stenosis. Additionally, 23 (4.5%) patients were diagnosed with patent foramen ovale. In total, 107 (21%) patients did not undergo echocardiography before discharge or death.

Figure 4. Left ventricular ejection fraction, with N: total number of patients; %: percentage of patients; LV: left ventricle

LVEF	N / %
>50%	340 / 66.7%
40-50%	29 / 5.7%
<40%	34 / 6.7%

Figure 5. Echocardiographic abnormalities diagnosed during hospitalization, with N: total number of patients; %: percentage of patients; LV: left ventricle; PFO: patent foramen ovale.

Echocardiographic abnormality	N / %
Segmental abnormality	74 / 14.5%
Left ventricular thrombus	07 / 1.4%
Valvular abnormality	81 / 15.9%
PFO	23 / 4.5%

DISCUSSION

To the best of the authors' knowledge, this is the first national study evaluating the prevalence of cardiac diseases diagnosed during hospitalization of patients with acute ischemic stroke.

It is classically known that comorbidities such as systemic arterial hypertension, diabetes mellitus, dyslipidemia, heart failure, and arrhythmias are related to the occurrence of

stroke, and that with better adherence to prevention programs, early detection, and adequate treatment of these risk factors, many events could be avoided.[5]

The percentage of underdiagnosed cardiac diseases in the general population varies according to the specific condition, the population studied, and the diagnostic methods used. Recent studies suggest that underdiagnosis of cardiac diseases is a significant and multifactorial problem.

Isolated atrial fibrillation (AF) is responsible for approximately 20% of ischemic strokes.[7] Estimates in the United States indicate that between 11% and 23% of cases may be underdiagnosed.[13] In a study using a back-calculation approach, it was estimated that in 2009, 13.1% of AF cases in the United States were not diagnosed, and more than half of this population had a moderate to high risk of stroke.[14] In our analysis, only 5.5% of patients had a previous diagnosis of atrial fibrillation, while nearly three times as many patients (14.9%) received a diagnosis of atrial fibrillation during hospitalization, which was considered the cause of the stroke.

A study conducted in England estimated that approximately 20% of cases of coronary artery disease (CAD) remain underdiagnosed prior to death or severe complications.[15] A retrospective Swiss cohort evaluated 648 autopsies over three years and identified CAD in 24% of patients and acute or subacute myocardial infarction in 15%.[16] In our study, echocardiographic findings showed that 14.5% of patients had some degree of left ventricular segmental wall motion abnormality, suggesting a possible diagnosis of CAD. These patients were referred for outpatient follow-up after discharge for further investigation.

In heart failure, systematic reviews show underdiagnosis and/or misdiagnosis rates ranging from 16% in hospital settings to 68% in primary care referrals to specialists, reflecting the difficulty in distinguishing heart failure from other conditions such as chronic obstructive pulmonary disease (COPD).[17] In our cohort, 12.4% of patients were diagnosed with heart failure with mildly reduced or reduced ejection fraction, all without prior appropriate pharmacological treatment or guidance.

Patent foramen ovale (PFO) is associated with ischemic stroke, particularly in young patients with stroke of undetermined origin. It is found in approximately 25% of the general population, but in up to 50% of patients with cryptogenic stroke under 60 years of age, suggesting a causal relationship in many cases.[18] In young patients without traditional risk factors and with high-risk anatomical PFO, percutaneous closure significantly reduces the risk of recurrent ischemic stroke.[19] Therefore, its diagnosis is essential to improve prognosis and survival. In our study, patients underwent only transthoracic echocardiography due to the lack of transesophageal echocardiography at our institution, which made more accurate stratification and measurement of PFO during hospitalization impossible. In selected cases, patients were referred for further investigation after discharge.

Finally, monogenic cardiac diseases such as hereditary cardiomyopathies and genetic arrhythmias present even higher rates of underdiagnosis. A Swiss retrospective autopsy cohort identified clinically undiagnosed cardiac amyloidosis in 8% of patients.[16] In a cohort of patients undergoing cardiac catheterization, only about 35% of individuals with pathogenic genetic variants and clinical criteria for monogenic disease had a documented diagnosis, suggesting that approximately 65% of these cases remain underdiagnosed.[20] In

our study, patients were not submitted to genetic testing due to the unavailability of this examination at our service.

In populations from low- and middle-income countries, such as India, a study based on symptoms and self-report suggests that the prevalence of undiagnosed heart disease may be substantial, especially among middle-aged and elderly adults, although data are less precise and rely on indirect methods.[21]

Clinical, sociodemographic, and healthcare access factors are associated with underdiagnosis of cardiac diseases. The presence of atypical or absent symptoms in women and older adults is an important factor in the underdiagnosis of myocardial infarction.[22,23] The presence of other comorbidities such as chronic lung disease, anemia, and renal failure may confound the clinical picture, leading to misattribution of symptoms and delayed diagnosis.[17] Psychiatric conditions such as depression, anxiety, and psychosocial stress are nontraditional factors that increase cardiovascular risk and may contribute to underdiagnosis, as their symptoms may be attributed to psychosomatic causes or underestimated.[24]

Socioeconomic factors and social determinants of health, such as low educational level, lower income, limited access to healthcare services, inadequate social support, and cultural barriers, hinder early diagnosis and appropriate management of cardiac diseases, especially in vulnerable populations.[24] The lack of diagnostic resources is also a limiting factor, particularly for valvular heart disease. Cardiac auscultation alone has limited sensitivity for detection, especially in older adults and in cases of mitral or aortic regurgitation. The absence of a murmur does not exclude significant disease, making complementary imaging methods such as echocardiography necessary, particularly in high-risk groups.[25]

This study has limitations inherent to its retrospective design based on medical record review, which precludes follow-up of the included individuals. In addition, incomplete medical records may have occurred, a bias beyond the authors' control. In 87 records (17.1%), the electrocardiogram report was not documented, making it impossible to determine whether the test was not performed or simply not recorded. In some cases, due to hospital overcrowding, the neurology team opted for early discharge with outpatient follow-up for complementary tests; however, some patients did not attend follow-up visits. Finally, given that stroke is a severe and potentially fatal condition, in some cases there was insufficient time to complete the etiological investigation. In total, 107 patients (21%) did not undergo echocardiography before discharge or death. Therefore, it is possible that the findings of this study are underestimated and that the true number of underdiagnosed cardiac diseases is higher.

CONCLUSION

In the present study, the results demonstrated a high prevalence of underdiagnosed cardiac diseases in patients hospitalized with acute ischemic stroke, particularly atrial fibrillation/flutter, heart failure, and moderate to severe valvular abnormalities. Echocardiographic findings highly suggestive of the ischemic stroke etiology were also identified, such as left ventricular thrombus, as well as findings that require further investigation to establish an etiological diagnosis, such as patent foramen ovale (PFO). It

can therefore be concluded that, in a considerable proportion of cases, ischemic stroke represents the first clinical manifestation of underlying cardiac diseases that could have been previously diagnosed and treated. Thus, better adherence to prevention programs, early detection, and appropriate management of these risk factors could potentially prevent a significant number of such events.

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