

## ARTIGO ORIGINAL



## Stroke Mimics Profile in a Tertiary Hospital in Salvador, Bahia, Brazil

### *Perfil de Mimetizações de Acidente Vascular Cerebral em um Hospital Terciário de Salvador, Bahia, Brazil*

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**Introduction:** Strokes mimics are a set of non-vascular disorders that mimic an acute stroke. There are several studies in the literature about this theme, but we still have little information about this condition in Brazil. **Method:** This is a series of stroke case mimics evaluated by neurologists at a tertiary hospital in Salvador-BA from December/2020 to August/2023. **Results:** 441 patients were admitted, and 152 strokes were found to mimic (34%). Of these, 99 women with a mean age of 61.7 years and a median NIHSS of 4 at admission. One hundred ten patients (72.4%) had some risk factor, of which 100 had hypertension, 57 had DM, 24 had a previous stroke, 11 had CAD, and 9 had AF. The most prevalent etiology for stroke mimics was epileptic events, with 29.6%. None of the patients with stroke mimics underwent thrombolysis or thrombectomy, but 25 received mono-anti-aggregation and 30 dual- anti-aggregation on admission. The median mRs at discharge was 0, with 7.2% of deaths. **Conclusion:** The stroke mimics represent a considerable portion of patients admitted with suspected stroke to the service, drawing attention to the prevalence being higher than the average found in the literature, with epileptic events being the most prevalent etiology. **Keywords:** Stroke Mimics; Stroke; Epidemiology.

**Introdução:** as mimetizações de AVC são um conjunto de distúrbios não vasculares que imitam um AVC agudo. Existem vários estudos na literatura sobre esse tema, mas ainda temos pouca informação sobre essa condição no Brasil. **Método:** esta é uma série de casos de mimetizações de AVC avaliados por neurologistas em um hospital terciário em Salvador-BA de dezembro de 2020 a agosto de 2023. **Resultados:** Foram admitidos 441 pacientes, e 152 casos de AVC mimetizadores foram identificados (34%). Destes, 99 eram mulheres com idade média de 61,7 anos e um NIHSS mediano de 4 na admissão. Cento e dez pacientes (72,4%) apresentavam algum fator de risco, dos quais 100 tinham hipertensão, 57 tinham DM, 24 tinham histórico de AVC anterior, 11 tinham DAC e 9 tinham FA. A etiologia mais prevalente para os mimetizadores de AVC foi eventos epiléticos, com 29,6%. Nenhum dos pacientes que mimetizaram um AVC foi submetido a trombólise ou trombectomia, mas 25 receberam terapia com mono-antiagregantes e 30 duplo-antiagregantes na admissão. A mediana do mRs na

alta foi 0, com 7,2% de óbitos. Conclusão: os mimetizadores de AVC representam uma parcela considerável de pacientes admitidos com suspeita de AVC no serviço, chamando a atenção para a prevalência ser maior do que a média encontrada na literatura, com eventos epiléticos sendo a etiologia mais prevalente.

Palavras-chave: Mimetizadores de AVC; AVC; Epidemiologia.

Stroke stands as a grave clinical concern, ranking as the second leading cause of death globally and claiming the top spot in Brazil in 2022, with 114,511 fatalities recorded within Brazilian borders.<sup>1,2</sup> Given the narrow therapeutic window for interventions such as chemical thrombolysis and mechanical thrombectomy, stroke represents a medical emergency warranting immediate attention within any hospital's emergency department.<sup>3</sup>

In light of these critical considerations, rapid identification of acute stroke becomes imperative within emergency services.<sup>3-5</sup> However, the exigencies of time often curtail the window for formulating diagnostic hypotheses, increasing the risk of diagnostic errors.<sup>4,6</sup> Among the most concerning diagnostic pitfalls are the "stroke chameleon," characterized by an acute stroke with atypical presentation, which may divert consideration from stroke, and "stroke mimics," clinical conditions of non-vascular origin that masquerade as acute strokes.<sup>4,6</sup>

In the global literature, numerous studies have delved into stroke mimics, elucidating patient profiles, prevalent etiologies, and predictive factors.<sup>4,5,7</sup> However, in Brazil, our understanding of stroke mimics in our population remains limited, with only one study conducted to date.

This study, albeit informative, had a relatively small sample size compared to other series and focused solely on patients from a single center.<sup>8</sup> Consequently, it is imperative to expand our knowledge base by conducting a study to comprehensively evaluate stroke mimics within our territory, involving patients from different centers.

The main objective of our study was to delineate the clinical-epidemiological profile of patients presenting with stroke mimics, evaluated at a tertiary hospital in Salvador-BA (Santa Izabel

Hospital). The other goals was to ascertain the most prevalent etiologies observed within our service, identify the primary clinical management strategies employed by the neurology team, and evaluate the outcomes associated with this patient profile.

## Materials and Methods

### Study Design

This study constitutes a retrospective, observational, and descriptive series of cases. Mean and median were employed to analyze quantitative variables, while frequency was utilized to analyze qualitative variables.

To assess the outcomes of the patients, two key instruments were utilized:

1. National Institutes of Health Stroke Scale (NIHSS): This tool objectively quantifies the impairment caused by a stroke, with scores ranging from 0 to 42. A higher NIHSS score indicates a greater degree of impairment.
2. Modified Rankin Scale (mRs): This scale measures the degree of disability or dependence in daily activities among individuals who have experienced a stroke or other neurological disabilities.

### Inclusion Criteria

Patients included in the study were required to meet the following criteria:

- Age of at least 18 years.
- Manifestation of a neurological deficit within 24 hours of admission to the emergency unit.
- Activation of a protocol by the emergency service for rapid assessment by the neurology

team and performance of imaging tests (including non-contrast computed tomography, computed tomography angiography, and magnetic resonance imaging, if necessary) for each patient suspected of stroke with symptom onset within 24 hours.

- Determination by the neurology team, based on clinical and imaging data, regarding whether the case in question was related to a stroke, transient ischemic attack (TIA), or constituted a stroke mimic (the latter being included in this study).

### Ethical Considerations

Approval for this study was obtained from the local ethical committee at the hospital.

### **Results**

Out of the initially selected 471 patients (identified through the institution's stroke protocol), 30 patients were subsequently excluded due to erroneous triggering (Figure 1). This left a total of 441 patients for evaluation in this study, comprising 289 patients (66%) with symptoms suggestive of stroke or transient ischemic attack (TIA) and 152 patients (34%) with stroke mimics. Among the total sample, 99 patients (65.1%) were female, averaging 61.7 years (Table 1).

Of the patients identified with stroke mimics, 110 individuals (72.4%) presented with at least one risk factor, with hypertension being the most prevalent, affecting 100 patients (65.8%). This was followed by diabetes mellitus, which affected 57 patients (37.5%), previous stroke in 24 patients (15.8%), coronary artery disease in 11 patients (7.2%), and atrial fibrillation in 9 patients (5.9%) (Table 1).

We assessed clinical severity through the National Institutes of Health Stroke Scale (NIHSS) and observed a median score of 4 (ranging from 0 to 29). Specifically, 103 patients (67.8%) had an NIHSS score between 0 and 5, 37 patients (24.3%) had scores between 6 and 15, and 12 patients (7.9%) had an NIHSS score of 15 (Table 1).

Regarding the clinical picture presented among 152 patients with stroke mimics, 25 patients presented with motor deficit upon admission, 18 with speech impairment, and 12 developed facial paralysis; 14 patients had motor deficit and speech impairment, 4 had facial paralysis and motor deficit and 9 patients had speech impairment and facial paralysis. Ten patients presented the three reported signs, while 60 did not present any reported symptoms (Table 2).

Among the primary etiologies for stroke mimics observed in the service, epileptic conditions such as seizures and Todd's paralysis were the most prevalent, affecting 28 and 17 patients, respectively. Infectious and metabolic disorders accounted for 20 cases, while conversion disorders were responsible for stroke mimics in 19 patients. Notably, Bell's palsy was observed in 4 patients, and labyrinthopathy in 7 patients (Figure 2).

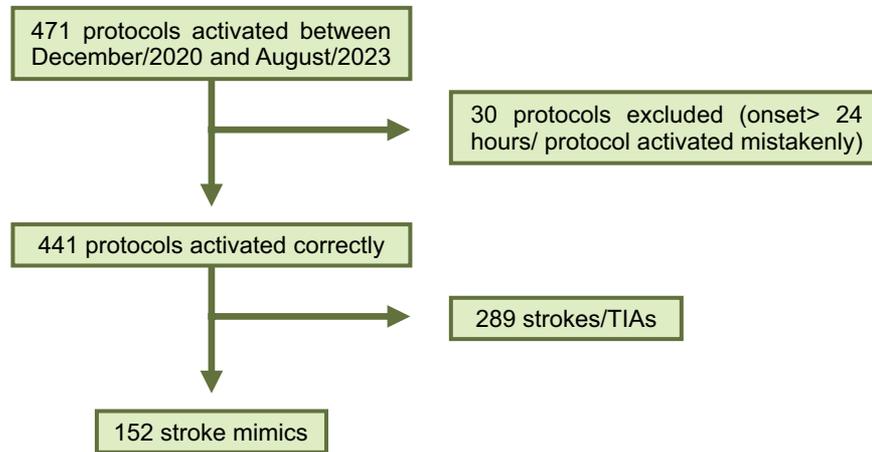
About the treatment strategies recommended by the neurology team, mono antiplatelet therapy was prescribed for 25 patients (16.4%), while dual antiplatelet therapy was suggested for 30 patients (19.7%). Notably, no patients were deemed eligible for thrombolysis or mechanical thrombectomy (Figure 3).

Regarding the presence of complications (characterized as death, infection, or hemorrhagic transformation), it was possible to identify such findings in 38 patients (25%). The average length of stay was 7.42 days, while the median was 4 days. We found a median of 0 in the modified Rankin scale (mRs), with mRs of 0 being the most prevalent, also with 98 patients (60.5%), while 11 patients died (7.2 %) (Table 3).

### **Discussion**

We observed a stroke mimic frequency of 34% within our sample, surpassing the prevalence reported in the most extensive review available in the literature, which approximates 25%.<sup>4</sup> Furthermore, the disparity becomes even more pronounced compared to the sole study involving a Brazilian sample: 34% *versus* 7.1%.<sup>8</sup> This

**Figura 1.** Selection of patients diagnosed with stroke mimics.



TIA = Transient Ischemic Attack

**Table 1.** Presence of sociodemographic aspects, risk factors, and NIHSS on admission.

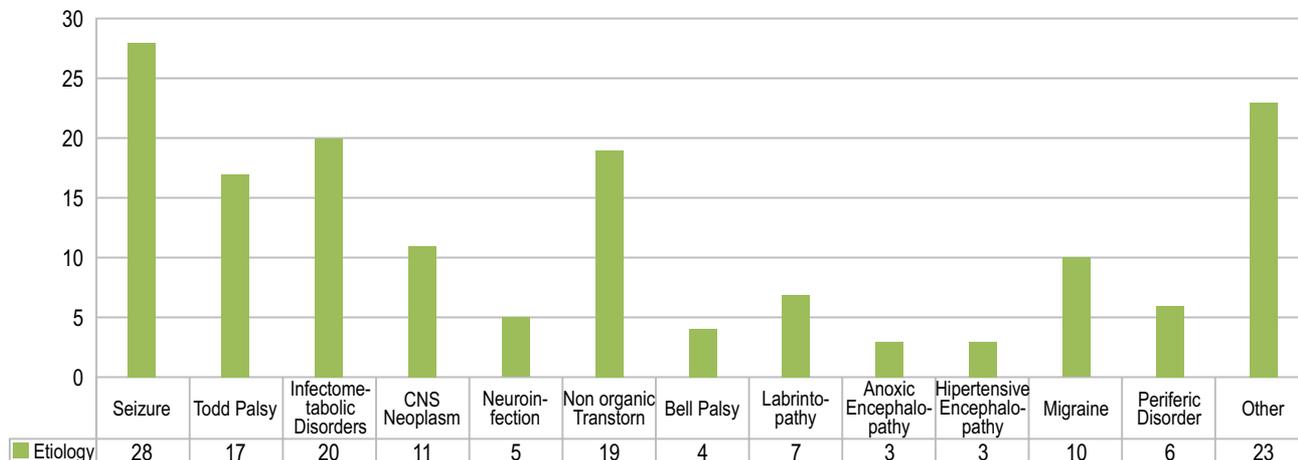
Sociodemographic Aspects	
Sex (female )	99 (65.1%)
Age (mean)	61.1 years
Risk Factors (HBP, DM, DLP, Stroke<,CAD, AF, Chagas, Mechanical Valves	
Yes	110 (72.4%)
HBP	100 (65.8%)
DM	57 (37.5%)
AVC	24 (15.8%)
AF	9 (5.9%)
CAD	11 (7.2%)
No	42 (27.6%)
NIHSS - Median: 4 (0-29)	
NIHSS 0-5	103 (67.8%)
NIHSS 6-15	37 (24.3%)
NIHSS ≥16	12 (7.9%)

HBP = High Blood Pressure. DM = Diabetes Mellitus AF = Atrial Fibrillation CAD = Coronary Artery Disease NIHSS = National Institute of Health Stroke Scale.

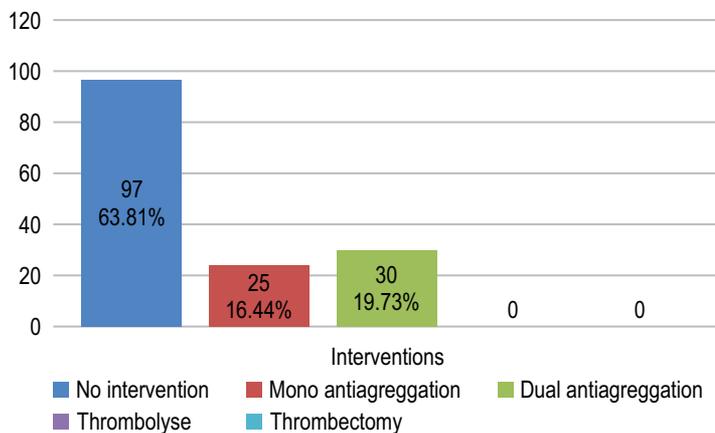
**Table 2.** Presence of neurological signs on admission.

Neurological Signs on Admission	
Absence of signs	60
Presence of signs	92
Pure motor deficit	25
Pure facial paralysis	12
Pure speech impairment	18
Motor deficit + facial paralysis	4
Motor deficit + speech impairment	14
Facial paralysis + speech impairment	9
Motor deficit + facial paralysis + speech impairment	10

**Figure 2.** Main etiologies of strokes mimics.



**Figure 3.** Management adopted by the neurology team.



**Table 3.** Outcomes of hospitalized patients and Modified Rankin Scale at discharge.

Outcomes	
Complications (infection, hemorrhagic transformation, death)	38 (25%)
Days of Internation	Mean: 7.42 days / Median: 4 days
Rankin (Median): 0	
Rankin 0	92 (60.5%)
Rankin 1	18 (11.8%)
Rankin 2	8 (5.3%)
Rankin 3	6 (3.9%)
Rankin 4	13 (8.6%)
Rankin 5	4 (2.6%)
Rankin 6	11 (7.23%)

variance may be attributed to several factors, including the shorter evaluation window (< 4.5 hours) and the involvement of stroke team physicians in the latter study.<sup>8</sup>

Regarding demographic characteristics, our findings closely align with existing literature. The average age of 61.7 years and the predominance of female patients (65.1%) mirror similar data reported in prior studies, which recorded an average age of 60.9 years and a female prevalence of 68%.<sup>6</sup>

We noted a higher frequency of hypertensive patients (65.8%) and diabetics (37.5%) within our population compared to figures reported in the literature.<sup>4</sup> This disparity can be attributed to the higher prevalence of hypertension and diabetes in Brazil relative to some developed countries, which serve as the primary basis for much of the literature. Our sample may not fully represent the population, influencing these figures.<sup>9,10</sup> However, the prevalence of previous strokes, atrial fibrillation, and coronary artery disease in our study aligns with existing literature.<sup>4</sup>

Regarding the clinical presentation observed upon admission, we noted differences in the

prevalence of motor deficits (34.9%) and speech and language alterations compared to figures reported in the literature (47.7% and 22.3%, respectively).<sup>11</sup> This variance may be explained by the comparison between two single-center studies, each with a limited number of patients, which may not provide a comprehensive representation of the prevalence of these clinical manifestations.

Among the etiologies observed in patients with stroke mimics in our study, a notably high frequency of epileptic phenomena (29.6%) was evident, contrasting with a lower incidence of labyrinthopathies (4.6%). This finding diverges from what is typically reported in the literature, which often demonstrates a prevalence of over 20% for labyrinthopathies and less than 10% for epileptic seizures.<sup>4</sup> However, due to the small sample size in our study, it is premature to determine whether these trends reflect a broader Brazilian pattern.

Consistent with findings in the literature, patients in our study exhibited favorable outcomes, with few deaths and a low incidence of thrombolysis.<sup>4</sup> Notably, none of the patients in our study underwent thrombolysis, likely influenced by the infrequent use of thrombolysis

in our service and the prerequisite evaluation by the stroke team before administration.

Several measures can be implemented to enhance the accuracy of stroke mimic identification within our service. One approach involves the utilization of stroke mimic predictor scales.<sup>12-16</sup>

These scales generally prioritize the evaluation of younger patients without traditional stroke risk factors as more likely to have stroke mimics. Such assessments may warrant advanced neuroimaging techniques, such as magnetic resonance imaging, to enhance diagnostic precision.<sup>12-16</sup>

However, validating and familiarizing medical teams with these scales is essential. Additionally, promoting the presence of neurologists in emergency units could further aid in improving diagnostic accuracy. The study conducted by Ribas and colleagues in Brazil demonstrates that lower rates of stroke mimics are misdiagnosed as stroke, possibly attributed to its implementation within a Stroke Unit.<sup>8</sup>

## Conclusion

Our study is subject to inherent limitations, primarily due to its case series design, which precludes statistical analysis of the described findings. Additionally, being retrospective, there is a potential for data collection and recording losses. To address these limitations, our team plans to conduct a prospective cohort study to evaluate stroke mimic predictive factors within our population. Another constraint was the inconsistent utilization of MRI in all cases, hindering precise confirmation of ischemic events. However, it is noteworthy that neurologists evaluated all patients, and MRI was available when necessary, excluding cases where an alternative diagnosis was evident.

In conclusion, stroke mimics constitute a significant portion of patients admitted with suspected stroke, with a prevalence higher than the average reported in the literature. Epileptic events emerged as the primary etiology in our study, diverging from findings in other sources. Our study highlights potential strategies for improving

accuracy, including evaluating predictive scales and promoting neurologist presence in emergency services.

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