

Clinical-epidemiological profile of individuals with stroke admitted to the emergency department of a Brazilian public hospital

Perfil clínico-epidemiológico de indivíduos com AVC internados no serviço de emergência de um hospital público brasileiro

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ABSTRACT

Introduction: Obtaining accurate data on stroke epidemiology remains a challenge, primarily due to the lack of information highlighting the significant impact of this health issue on the global population and its economic implications, particularly in Brazil.

Objective: to evaluate the clinical-epidemiological profile of patients admitted to the stroke unit in a Brazilian public hospital.

Methods: cross-sectional observational study with analysis of medical records of patients admitted to the stroke unit of a Brazilian public hospital followed by plotting on a spreadsheet for statistical procedures.

Results: During the study period, 720 patients were analyzed, with a mean age of 68.2 ± 14.57 years, and 70% were women. Arterial hypertension was the main comorbidity (81.2%), followed by diabetes mellitus (33.0%). The mean time of stroke onset time (ictus), admission to CT scan, and admission to the start of reperfusion therapy, in minutes, was 672, 13, and 48, respectively. Mortality was 16,6%.

Conclusion: stroke is a neurological emergency, and it is essential to know the epidemiological profile of affected patients and the performance of specialized services in their management.

Keywords: Stroke, Ischemic Stroke, Hemorrhagic Stroke, Epidemiological Profile, Urgent Care.

RESUMO

Introdução: Obter dados precisos sobre a epidemiologia do acidente vascular cerebral (AVC) continua sendo um desafio, principalmente devido à falta de informações que evidenciem o impacto significativo desse problema de saúde na população global e suas implicações econômicas, especialmente no Brasil.

Objetivo: Avaliar o perfil clínico-epidemiológico de pacientes admitidos na unidade de AVC de um hospital público brasileiro.

Métodos: Estudo observacional transversal com análise dos prontuários dos pacientes admitidos na unidade de AVC de um hospital público brasileiro, seguido pela tabulação em uma planilha para procedimentos estatísticos.

Resultados: Durante o período do estudo, foram analisados 720 pacientes, com idade média de $68,2 \pm 14,57$ anos, sendo 70% mulheres. A hipertensão arterial foi a principal comorbidade (81,2%), seguida por diabetes mellitus (33,0%). O tempo médio desde o início do AVC até o atendimento (ictus), da admissão até a tomografia e da admissão até o início da terapia de reperfusão, em minutos, foi de 672, 13 e 48, respectivamente. A taxa de mortalidade foi de 16,6%.

Conclusão: O AVC é uma emergência neurológica, e é essencial conhecer o perfil epidemiológico dos pacientes afetados e o desempenho dos serviços especializados no seu manejo.

Palavras-chave: Acidente Vascular Cerebral, Acidente Vascular Cerebral Isquêmico, Acidente Vascular Cerebral Hemorrágico, Perfil Epidemiológico, Atendimento de Urgência.

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INTRODUCTION

Stroke is a condition that substantially impacts healthcare services, both public and private, worldwide. Its effects extend beyond the acute event to include total hospitalizations, sequelae, and functional disabilities in those affected by this disorder.¹ In 2018, Brazil recorded 197.000 cases treated under the Brazilian Unified Health System (SUS) due to stroke, resulting in significant healthcare expenditures, not only for acute treatment but also for personalized patient care and management of potential sequelae.¹

The two main types of stroke are ischemic and hemorrhagic. Ischemic Stroke (IS), the most prevalent type comprising 87% of cases, is caused by a blockage in blood flow to the brain, typically due to clots, resulting in ischemia and brain damage.² IS carries a mortality rate of 10% within the first 30 days and can reach 40% within the first year due to neurological sequelae, which often necessitate rehabilitation, with 70% of survivors unable to return to work. Hemorrhagic Stroke (HS), the second type, is caused by a rupture of a blood vessel in the brain.³ Since 1993, the American Heart Association (AHA) has classified stroke, along with trauma and myocardial infarction, as requiring basic and advanced life support.³

The use of tissue plasminogen activator (rt-PA) has become increasingly common and crucial in the acute management of IS.^{3,5} Thrombolysis represents the primary non-invasive treatment for IS, with a critical therapeutic window of 4.5 hours from symptom onset to minimize adverse effects.^{2,3} Thrombectomy, whether combined with intravenous thrombolysis using rt-PA or not, offers potential benefits for patients with large vessel occlusion, including earlier therapy initiation and a higher likelihood of reperfusion.⁶ However, adding intravenous thrombolysis to mechanical thrombectomy may elevate the risk of intracerebral hemorrhage and other bleeding complications.⁷

From January 2008 to August 2023, 2.239.701 patients were hospitalized due to stroke in Brazil, with 310.463 (13.9%) in Minas Gerais and 9,871 in Juiz de Fora alone.⁴ These hospitalizations incurred substantial costs for national public health, totaling approximately R\$2.955.878.003,39 during this period (R\$449.185.044,98 in Minas Gerais alone). Among these patients, 355.121 deaths were reported, with 45.002 (14.5%) in Minas Gerais.⁴

Specifically in Juiz de Fora, 3.581 (36.27%) identified as White, while 1.138 and 1.668 identified as Black and Mixed race, respectively. The highest incidence of stroke (2.592 individuals) occurred among those aged 60-69 years old, with the 70-79 age group being the second most affected, accounting for 2.367 cases, together comprising 50% of all cases in the municipality.

Despite these statistics, there remains a need for further epidemiological data on individuals with IS in Juiz de

Fora, as well as information on their main clinical manifestations and hospital management.

METHODS

This is a cross-sectional observational study in which all patients admitted to the neurological emergency unit of Hospital Maternidade Therezinha de Jesus (HMTJ), located in the municipality of Juiz de Fora, state of Minas Gerais, from January 1, 2021 to January 31, 2023, were evaluated. The study was conducted in accordance with Resolution 466/2012. The project was evaluated and approved by the Research Ethics Committee of the Faculty of Medical Sciences and Health of Juiz de Fora - SUPREMA, Project: CAAE: 61799422.8.0000.5103, and the Informed Consent Form was obtained from the participants. Ordinance No. 772, dated August 21, 2020, from the Ministry of Health enabled the said establishment as an Urgent Care Center type III for stroke patients. Therefore, HMTJ provides specialized emergency neurological care 24 hours a day, 7 days a week. Type III Urgent Care Centers are multidisciplinary clinical care units with at least 10 beds, coordinated by a neurologist, dedicated to the care of patients affected by any type of stroke up to fifteen days after hospital admission, with the function of continuing acute phase treatment, early rehabilitation, and complete etiological investigation.

Sociodemographic and clinical data were extracted from the institutional medical records of individuals admitted to the neurological emergency stroke unit of HMTJ. To preserve their identities, each individual was randomly assigned a number. The following information was analyzed: gender, age, comorbidities such as systemic arterial hypertension (SAH), diabetes mellitus (DM), obesity, sedentary lifestyle, and dyslipidemia, lifestyle habits such as smoking and alcohol consumption, stroke ictus, National Institutes of Health Stroke Scale (NIHSS) score at admission and discharge, cranial computed tomography (CCT) scan results, intravenous thrombolysis and its respective admission-CT time, admission-needle time (time elapsed between hospital admission and intravenous infusion of chemical thrombolytic, if indicated), length of hospital stay, modified Rankin Scale (mRS) at discharge, and mortality rate. The performance of mechanical thrombectomy for proximal large vessel occlusion, however, is not available at HMTJ or other public hospitals in the municipality. Therefore, when indicated, thrombolysis was performed after contraindications were excluded.

The NIHSS⁵ is a scale that can be quickly applied to assess the severity of a stroke without compromising the therapeutic window. It consists of 15 items, which include: level of consciousness, conjugate gaze, visual fields, visual loss, motor assessment of upper and lower limbs, limb ataxia, sensation, language, dysarthria, and extinction or inattention (neglect). The mRS, in turn, evaluates the overall

functional capacity of the individual, as well as their level of functional dependence. The scale assigns values from zero to six (no symptoms, no significant disability, slight disability, moderate disability, moderately severe disability, severe disability, and death, respectively) depending on the examiner's assessment of both physical and non-physical aspects of each individual.

Inclusion criteria were individuals over 18 years of age, admitted to the health institution during the aforementioned period, with a clinical presentation compatible with stroke. Those admitted outside the proposed study period or with absent/inadequate clinical data in the institutional medical records were excluded from the analysis conceived in this article.

Qualitative variables were described according to absolute number, frequencies, and percentages. Data were expressed as mean and standard deviation, as well as minimum and maximum values when appropriate. Pearson's test was performed on the mentioned spreadsheet, using Microsoft Excel® 2023, to analyze the correlation between two study variables: the correlation between discharge NIHSS and length of hospital stay.

RESULTS

During the study period, 824 patients were admitted to the neurological emergency stroke unit. Of these, 70 (8.5%) were referred to their originating institutions as their conditions were not compatible with stroke. Another 34 patients were excluded due to insufficient clinical data. Thus, 720 patients (87.4%) met the inclusion criteria and were selected for the study (Figure 1), which 499 (69.3%) were female. The average age of the individuals was 68.2 ± 14.57 years, with 73.2% (527) of them being 61 years or older (Figure 2).

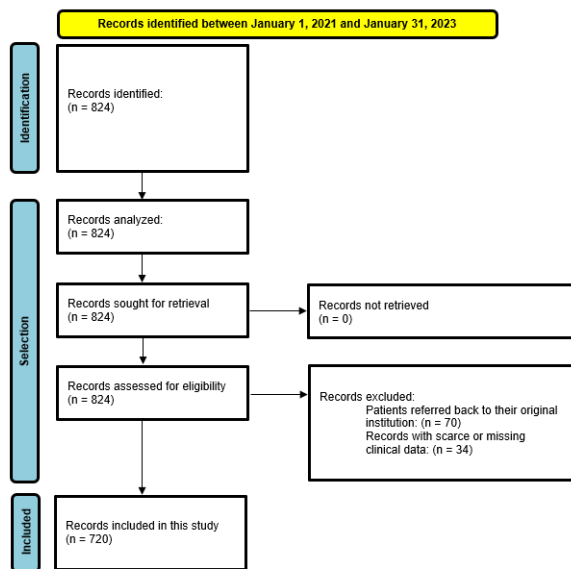


Figure 1. Patient selection flowchart.

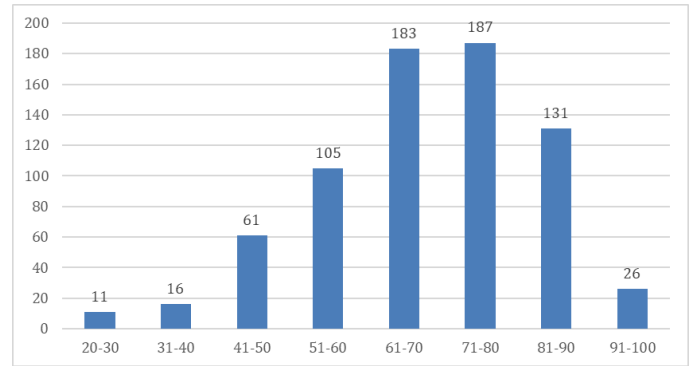


Figure 2. Distribution of individuals by age group.

Among all comorbidities analyzed (Table 1), SAH was the primary condition associated with stroke in the sample, present in 582 (81.2%) individuals. The second most frequent was DM, in 238 (33.0%) of them. The average stroke onset time (ictus) was 672 minutes, with only 238 (33.0%) individuals meeting the time criteria for thrombolysis (Table 1).

NIHSS scores of the patients can be seen in Table 1. Overall, the average NIHSS score in the study sample was 8. While quantifying ictus and NIHSS, individuals were referred to the institution's radiology service for radiological diagnosis via non-contrast CCT scan. The mean time from admission to CCT scan for 616 patients was 13 minutes. It is noteworthy that 104 (14.4%) individuals underwent non-contrast CCT scan at their original hospital before transfer to the institution analyzed here and were therefore not included in the statistical analysis of this variable. In 334 (46.4%) individuals, CCT scan showed no abnormalities. An equal proportion (46.4%) revealed a diagnosis of IS, while 36 (5.0%) were diagnosed with HS. Sixteen patients (2.2%) received other diagnoses.

Table 1. Frequency of comorbidities and lifestyle habits, distribution by stroke onset time, non-contrast CCT scan results and admission NIHSS.

Variables	n	Relative (%)
Systemic Arterial Hypertension	582	81,25
Smoking	266	36,94
Diabetes Mellitus	238	33,05
Alcoholism	200	27,77
Sedentary lifestyle	113	15,69
Dyslipidemia	74	10,27
Obesity	34	4,72
Ictus		
< 4,5h	238	33,05
5-6h	115	15,97
6-24h	277	38,47
> 24h	36	5
Uncertain	54	7,5
Non-contrast CCT scan results		
Normal	334	46,4
Hemorrhagic Stroke	36	5,0
Ischemic Stroke	334	46,4
Other diagnosis	16	2,2
NIHSS at admission		
0-4	272	37,77
5-10	193	26,80
11-20	193	26,80
21-30	31	4,30
> 31	1	0,13
Sedated	26	3,61
RLC	3	0,41
Non-cooperative patient	1	0,13

CCT: cranial computed tomography; NIHSS: National Institute of Health Stroke Scale; RLC: Reduced Level of Consciousness.

In the analyzed service, 74 (10.3%) individuals met all eligibility criteria and underwent intravenous thrombolysis. The main contraindication to this therapy was stroke onset time exceeding 4.5 hours in most individuals. Low NIHSS score (below 4) and uncertainty about stroke onset time were the next most frequent contraindications, identified in 86 (11.9%) and 48 (6.6%) patients, respectively (Table 2). Additionally, in the hospital's service, the average time from admission to the start of intravenous thrombolytic infusion (door-to-needle time) was 48 ± 34.75 minutes.

Table 2. Thrombolysis and its main contraindications, length of hospital stay in days and mortality.

Variables	n	Relative (%)
Thrombolysis		
Yes	74	10,27
No	646	89,72
Reasons for not administering thrombolysis		
Out of time window	427	59,30
Low NIHSS	86	11,94
Ictus uncertain	48	6,66
Hemorrhagic stroke	38	5,27
Hemorrhagic transformation risk	17	2,36
Full anticoagulation	6	0,83
High and refractory blood pressure	2	0,27
Other diagnoses		
Thrombolized	22	3,05
	74	10,27
Length of hospital stay (days)		
< 7	376	52,22
8 - 14	171	23,75
15 - 21	72	10,0
22 - 30	47	6,52
31 - 60	38	5,27
> 60	16	2,22
Mortality		
Death	120	16,66
Survived	600	83,33

NIHSS: National Institute of Health Stroke Scale

Regarding hospital stay, the mean duration was 12 days, ranging from 0 to 120 days. More than half (52.2%) of the patients had a hospital stay of less than seven days. Finally, out of 720 individuals, 120 (16.7%) died, while the 600 others were discharged or transferred to other health institutions in the city. The mean NIHSS and mRS score at discharge were 4 and 2, respectively (Table 3).

Table 3. NIHSS at hospital discharge and mRS at hospital discharge

Variables	n	Relative (%)
NIHSS at hospital discharge		
0 - 4	365	50,69
5 - 10	114	15,83
11 - 20	60	8,33
21 - 30	5	0,69
>31	1	0,13
Transferred	27	3,75
Not reported	27	3,75
Sedated	1	0,13
Death	120	16,6
mRS at hospital discharge		
0	84	11,66
1	64	8,88
2	36	5,0
3	42	5,83
4	66	9,16
5	36	5,0
6	120	16,6
Transferred	27	3,75
Not reported	245	34,02

mRS: Modified Rankin Scale; NIHSS: National Institute of Health Stroke Scale;

The Pearson test was used to quantify the numerical correlation between NIHSS at discharge and hospital stay duration in days, yielding a value of 0.51, indicating a moderate positive correlation between these variables.

DISCUSSION

This study showed a higher frequency of stroke in females (69%), contrary to the results of many other epidemiological studies of this disease, which generally indicate a slightly higher prevalence in males.⁸⁻¹⁵ A study conducted at the Hospital Risoleta Tolentino Neves (HRTN)¹³ and another at an unspecified hospital in Belo Horizonte/MG¹⁶ showed a higher incidence in men (55% and 52%, respectively), diverging from the statistical results obtained in this study. Another study in Uberlandia, Minas Gerais, did not show a predominance between sexes.¹⁷ It is important to note that 53% of the population in Juiz de Fora is comprised of females.¹⁸

In our study, as well as in the other two mentioned above, the elderly population was most affected by this disease, with 73.2% of our sample being 61 years or older, and the age group of 71-80 years being the most affected, representing 26% of cases. Moreover, in the three studies conducted in the state^{13,16,17}, approximately half were aged 60 or older.

SAH was the most prevalent comorbidity in our study, consistent with the literature.^{9,11-14,16,17,19} One study in a hospital in Rio Grande do Sul¹⁹ demonstrated a prevalence of SAH of 99%, following the guidelines recommended for endovascular treatment of acute IS.²⁰ DM is a known risk factor for stroke occurrence, being one of the three main comorbidities associated with this disease in our study (33%) and in others.^{9,11,12,14,19,21} At a regional level,^{13,16} its prevalence has also been considered significant by other studies in the state. Smoking, alcohol consumption, dyslipidemia, and previous ischemic events are also significant factors associated with stroke.^{17,22}

Additionally, in line with literature data, IS was more prevalent than HS in the studied population. However, only 10% of them received intravenous rt-PA treatment: a higher percentage compared to other national healthcare settings.^{13,15} A study from the northern region²² achieved a 44% rate of intravenous thrombolysis from in a year period.

The main factor associated with contraindication to thrombolysis was stroke onset time exceeding 4.5 hours, present in approximately 60% of our sample (average onset time of 672 minutes). In the study by Mourão et al. in Belo Horizonte/MG¹³, 78.9% of the sample had an onset time above 4.5 hours, with an average time of 780 minutes. Furthermore, another study in Minas Gerais¹⁷ showed onset times of 258 minutes (4.18 hours) for their groups. In another study in the southern region, specifically Paraná,¹⁴ it was not possible to determine onset time in 71.15% of patients, highlighting the healthcare team's difficulty in this

essential parameter for therapeutic application. Studies have shown that thrombolysis with rt-PA, at a dosage of 0.9 mg/kg intravenously in patients with acute IS within 4.5 hours of symptom onset, improves clinical and functional outcomes after three months, with Level 1A evidence.^{23,25} Furthermore, any delay in thrombolytic infusion results in reduced benefits.

Decree N°. 664/12 approved the Clinical Protocol and Therapeutic Guidelines for Thrombolysis in Acute IS²⁰, updated in 2021, advocating for an ideal door-to-needle time of less than 60 minutes²⁷, which has been used as a quality criterion. In our study, the average door-to-needle time was 48 minutes, while the study from Paraná¹⁴ showed a time of 1.12 ± 0.39 hours. The average NIHSS score at admission in our study sample was 8, with 60% scoring up to 10 points, consistent with findings by Locatelli and colleagues.¹⁰ The average length of hospital stay in this study was 12 days, with more than half of the patients staying less than seven days in the hospital. This finding aligns with studies from Minas Gerais¹³ and Rio Grande do Sul¹⁹, both reporting 12 days, as well as a study from Brasília²⁸ (11 days), although it was longer than those from São Paulo⁸ and the central-west region⁹, with seven and eight days, respectively. The study by Alvares et al.⁹ in the central-west region evaluated the impact of the Family Health Program on hospitalization times. Those covered by the program had an average reduction of 1.6 days in hospitalization compared to non-covered individuals. Furthermore, the hospitalization rate per 10,000 inhabitants was lower in the covered area (4.7-6) compared to the non-covered area (11.4-22.9). This underscores the importance of preventing comorbidities and risk factors and emphasizes the role of strengthening primary health care in reducing acute cerebrovascular events. Finally, the mortality rate due to stroke found in this study was 16.7%, lower than in studies from Mato Grosso⁹, southern regions^{10,19} and Minas Gerais¹³, but higher than that found by Barella et al. at the Hospital São José in Criciúma – SC.¹²

The study's limitations include potential underestimation of comorbidities due to reliance on self-reported data or information from companions. Additionally, the insufficient assessment of high NIHSS scores and mRS in all patients likely led to incomplete clinical profiles. The lack of follow-up for all hospitalized patients, particularly given the service's coverage of 93 neighboring municipalities under SUS, further hinders the evaluation of long-term outcomes from conventional and reperfusion therapies. Despite the recognized benefits of intravenous thrombolytic therapy since 1995, these limitations result in an incomplete understanding of the therapy's impact on patients' functional capacity post-procedure and other related clinical outcomes.

CONCLUSION

Stroke is a neurological emergency with rapid progression and irreversible damage, leading to high public health costs. Effective treatments are available, but timely intervention is crucial. Understanding patient profiles and service performance is key to optimizing stroke care.

AUTHORS CONTRIBUTIONS: Batista TRS contributed to the collection, analysis, and statistical interpretation of the data and its results, as well as the development of the foundational framework and the writing of the manuscript content. Leite BMB, Schettini DTM, Ferreira FV, Yamaguchi LC, Vieira BQ, and Vale TC contributed to the critical review of the content, conception, and design of the study. All authors approved the final version of the manuscript and are responsible for all its aspects, including the guarantee of accuracy and integrity.

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