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RESEARCH

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## PATIENTS TREATED WITH SUSPECTED STROKE: ANALYSIS OF THE ASSOCIATION BETWEEN DIAGNOSIS AND CLINICAL OUTCOME

*Pacientes atendidos com suspeita de acidente vascular encefálico: análise de associação entre diagnóstico e desfecho clínico*

*Pacientes tratados con sospecha de accidente cerebrovascular: análisis de la asociación entre diagnóstico y evolución clínica*

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### ABSTRACT

**Objective:** to verify the association between diagnosis and clinical outcomes in suspected cases of stroke treated in the emergency room of a high complexity hospital. **Method:** a cross-sectional and observational study, with secondary data and a quantitative approach, carried out on visits to patients with suspected ischemic or hemorrhagic stroke for six months. **Results:** from the total of 50 consultations, it was observed that among the diagnoses of stroke, the ischemic one with 18 cases (36%) and the hemorrhagic one with five (10%) stood out, and this represented the largest proportion of cases. deaths, with a total of three (6%). Within the sample, 24 (48%) had no confirmation of stroke, without any occurrence of death ( $p$ -value= 0.001). **Conclusion:** an association between the diagnosis of stroke and its clinical outcome was observed in the sample, with hospital discharge as the main outcome, but with a high percentage of deaths.

**DESCRIPTORS:** Stroke; Emergencies; Mortality; Patient discharge.

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## RESUMO

**Objetivo:** verificar a associação entre o diagnóstico e desfechos clínicos em casos suspeitos de Acidente Vascular Encefálico, atendidos no pronto-socorro de um hospital de alta complexidade. **Método:** estudo transversal e observacional, com dados secundários e abordagem quantitativa, realizado sobre atendimentos de pacientes com suspeita de Acidente Vascular Encefálico isquêmico ou hemorrágico durante seis meses. **Resultados:** do total de 50 atendimentos, observou-se que entre os diagnósticos de Acidente Vascular Encefálico, destacaram-se o isquêmico com 18 casos (36%) e o hemorrágico com cinco (10%), sendo que este representou a maior proporção de óbitos, com o total de três (6%). Dentro da amostra, 24 (48%) não tiveram confirmação de AVE, sem qualquer ocorrência de óbito ( $p$ -valor= 0,001). **Conclusão:** observou-se na amostra a associação entre o diagnóstico de Acidente Vascular Encefálico e seu desfecho clínico, com a alta hospitalar como principal desfecho, porém com um alto percentual de óbitos.

**DESCRITORES:** Acidente vascular cerebral; Emergência; Mortalidade; Alta do paciente.

## RESUMEN

**Objetivo:** verificar la asociación entre el diagnóstico y los resultados clínicos en casos sospechosos de Accidente cerebrovascular atendidos en el servicio de urgencias de un hospital de alta complejidad. **Método:** estudio transversal y observacional, con datos secundarios y abordaje cuantitativo, realizado en visitas a pacientes con sospecha de ictus isquémico o hemorrágico durante seis meses. **Resultados:** del total de 50 consultas, se observó que entre los diagnósticos de Accidente cerebrovascular se destacó el isquémico con 18 casos (36%) y el hemorrágico con cinco (10%), representando la mayor proporción de casos defunciones, con un total de tres (6%). Dentro de la muestra, 24 (48%) no tuvieron confirmación de diagnóstico, sin ocurrencia de muerte ( $p$ -valor= 0,001). **Conclusión:** se observó en la muestra una asociación entre el diagnóstico de Accidente cerebrovascular y su desenlace clínico, siendo el alta hospitalaria el principal desenlace, pero con un alto porcentaje de óbitos.

**DESCRIPTORES:** Accidente cerebrovascular; Urgencias médicas; Mortalidad; Alta del paciente.

## INTRODUCTION

The stroke is characterized as an important cause of death and disability in the population and has a great impact on the economic aspect of the health sector. It is a clinical emergency that occurs when there is obstruction or rupture of one of the cerebral vessels, interrupting the regular blood flow in the affected area.<sup>1</sup>

It can be classified in two main types: ischemic - resulting from the occlusion of a cerebral artery by an embolus or a thrombus, and hemorrhagic, when occurs the rupture of a vessel that generates blood leakage to the brain tissue or subarachnoid space.<sup>2</sup> Transient Ischemic Attack (TIA) is also common, consisting of a non-permanent obstruction of the cerebral circulation and less severe than a full stroke.<sup>3</sup>

Since 2012, stroke is the second leading cause of death in the world, with the projection that more than half of those affected before the age of 50 will die in the next eight years.<sup>4</sup> In Brazil, cerebrovascular diseases are the second leading cause of death in the population, only behind heart diseases.<sup>2,5</sup>

Because they are diseases that require agile and assertive intervention, several bundles validated in literature are dedicated to establishing care flows and algorithms with sequencing directed to each type of event.<sup>6</sup> In the approach and treatment to acute cases of ischemic stroke, there is thrombolytic therapy<sup>3</sup> and endovascular or mechanical thrombectomy.<sup>7</sup> For the approach to hemorrhagic stroke, the most used conduct is surgical, with the strategy of cranial decompression.<sup>8</sup>

Several factors related to the first assistance are associated with an unfavorable outcome for the patient, such as the delay for decision making and, consequently, for the effective thera-

peutic conduct in the face of the CVA aggravation.<sup>3</sup> Similarly, the population's lack of knowledge about CVA or failure to identify the initial symptoms are important points to be considered. Being this information deficit predominant in groups of older people and in individuals with less education.<sup>9</sup>

Studies demonstrate a great favorable impact for patients who received care within the therapeutic window, which favored the appropriate conduct for each confirmed case of stroke, resulting in drastic reductions in mortality and motor and cognitive deficits in affected patients.<sup>3,10</sup>

Although adequate and timely care is also conditioned to the logistics of the patients' transport to the emergency service, the emergency room (ER) needs to be structured and prepared to receive such demand, having the implementation of protocols as an essential tool for the standardization of conducts and the care flow.<sup>6,11</sup> However, the protocols' implementation requires knowledge about the service's profile, as well as the patients served there.

Therefore, this study is justified by the scientific relevance of its topic and for the public health area. In addition, it is believed that the situational diagnosis sought in this work will contribute to the following steps in the implementation of the CVA care protocol in the health service studied or in other facilities, in order to promote more effective care, the reduction in mortality and in the possibility of unfavorable clinical outcomes.

The proposed hypothesis for the study was that there was an association between the type of CVA diagnosis and its clinical outcomes. The objective of this research was to verify the association between the diagnosis and clinical outcomes in suspec-

ted cases of stroke, treated in the emergency room of a highly complex hospital.

## METHOD

This is a cross-sectional and observational study, with secondary data and quantitative approach, carried out on the assistance of patients with suspected ischemic or hemorrhagic stroke treated in an ER of a highly complex hospital.

### Study location and period

The research was conducted in October 2019 at the Heart Hospital of Natal, a private institution in the city of Natal, at the state of Rio Grande do Norte, Brazil and comprised the data recorded in electronic medical records from march to august 2019 (six-month period).

The hospital is a statewide reference in high complexity care in the cardiology, neurology, imaging, and hemodynamics fields, among other services. At the time of the survey, it had 149 inpatient beds, 40 of which were in the Intensive Care Unit and the remaining 109 in apartments and infirmaries. The ER is operational 24 hours a day and has an average of five thousand consultations per month, with 185 being the daily average.

### Population and sample calculation

The study population consisted of suspected cases of ischemic, hemorrhagic or Transient Ischemic Attack (TIA) that were admitted to the ER of the aforementioned hospital.

For sample calculation, we considered the number of patients treated in 2018 (the year before data collection), a period in which 208 cases of suspected stroke were attended in the ER (12 months). Therefore, the formula to calculate the simple random sample was used. By using the sampling error ( $E_0=0.05$ ) and the population size referring to six months ( $N=104$ ), the sample size  $n=82$  was obtained. The sample calculation was performed with the assistance of an online calculator, accessible through the link <https://calculareconverter.com.br/calculo-amostal/>.

The following inclusion criteria were chosen for the study: patients admitted to the hospital through the ER within the researched period; being identified in the electronic medical record or through the International Statistical Classification of Diseases and Health Problems (ICD 11), as a suspected case of ischemic or hemorrhagic stroke (ICD I64 was used as the research criteria);<sup>12</sup> having a record of a CT scan of the skull at some point in the treatment. As exclusion criteria, we considered: not having evolution records in electronic medical records; occurrence of patient's death before undergoing skull CT scan.

### Variables

The variables collected were categorical and nominal referring to each care, which included: gender, age group, day of the week of attendance, shift of care (daytime - 7:00 a.m. to 6:59 p.m./

nighttime - 7:00 p.m. to 6:59 a.m.), stroke diagnosis (ischemic/hemorrhagic/ TIA/ Unconfirmed); outcome in the ER (discharge/hospitalization / discharge in absentia); patient's final outcome (discharge/ death/ discharge in absentia); type of therapy adopted (thrombolysis/ neurosurgery/ conservative treatment). It is noteworthy that, for patients who were admitted to the hospital after being treated in the ER, their data were collected in a single hospitalization of the same patient, from admission to discharge or death and excluding readmissions (if any).

The age range categorization for this study was between  $< 60$  years and  $> 60$  years, adopting the criteria for division between patients considered aged and non-aged (Brazilian Legislation), since, in the case of stroke, older patients are a risk group for developing this injury.<sup>5</sup>

### Data Collection and Availability

The data collection occurred by consulting the electronic medical records in the institution's information system, on days and times convenient to the researchers, after the consent and written authorization of the administration.

As a search strategy in the information system, filters were applied to the desired assistance period and the ICD number assigned by the doctor in his care at the ER (I-64).

The access to the system was granted by the hospital through the provision of a login and password created for this purpose by the institution's Information Technology team. The data collected in this study were stored and are available at Mendeley Data repository, which can be accessed through the following link: <https://data.mendeley.com/datasets/tgs5rz874z/1>.

### Data Analysis

The data was tabulated and organized with the support of *Microsoft® Office Excel 2016* and the Statistical Package for the Social Sciences (SPSS) 20.0 version, used for inferential statistical analysis. After applying the normality test with the Kolmogorov-Smirnov Test, the non-normality of the sample was identified. Thus, the association analyses of categorical variables were performed using non-parametric tests: Pearson's chi-square test or Fisher's exact test. The confidence interval adopted was 95% (significance level  $p \leq 0.050$ ).

### Ethical Aspects

In advance to its execution, the research project was forwarded to the Research Ethics Committee of the Federal University of Rio Grande do Norte (CEP-UFRN), from the Federal University of Rio Grande do Norte, which obtained prior approval with opinion number 3,574,527.

To ensure free access to the patients' electronic medical records by the system, a consent form was signed by the institution to formally authorize the execution of the research, as well as the authorization to access the information in the medical records.

It is highlighted that the researchers did not obtain the personal identification information of the treated patients and,

therefore, the present work waives the Informed Consent Term, in accordance with Resolution No. 510/2016 of the National Health Council.<sup>13</sup>

## RESULTS

Given the initial application of the period and ICD-11 filters, a total of 106 consultations with ICD I-64 were obtained in the period from march to august 2019. Of these, duplicate information displayed in the system was removed, leaving 74 cases and, finally, after individualized analysis, 24 cases that did not meet the eligibility criteria were dropped, resulting in a final sample of 50 cases.

Of the total sample studied, 26 patients (52%) had their stroke diagnosis confirmed, of which 18 (36%) were of the ischemic type, five (10%) were hemorrhagic, and three (6%) were TIA.

Table 1 shows the characterization of the sample obtained, with a predominance of the female gender, which accounted for 16 cases (32%), as well as in the assistance of patients with 60 years or older, represented by a n of 21 (42%), among the confirmed cases of CVA.

During daytime hours, 35 cases (70%) were treated, of which 18 (36%) had a confirmed diagnosis. Among the attendance days, Thursday stood out with 17 consultations of suspected cases (34%) and nine (18%) confirmed cases (p-value > 0.050).

Table 2 shows the outcomes in the ER setting, in which 26 (52%) patients with confirmed CVA diagnosis were admitted to the hospital and four (8%) were admitted, but without diagnostic confirmation (p-value <0.001). Regarding the final outcome, five

(10%) died, of which all had a confirmed diagnosis (p-value = 0.051).

Table 3 shows that among the CVA diagnoses, the ischemic stroke stood out with 18 cases (36%) and the hemorrhagic stroke with five (10%), the last representing the highest proportion of deaths, with a total of three (6%). Of the total, 24 (48%) had no confirmation of CVA, without occurrence of death (p-value = 0.001).

Regarding the outcomes of the care with and without approach, it was noted that the total of four deaths (8%) was higher among the attendances that received conservative conduct. Among the care with medical intervention, this proportion was lower, with one attendance (2%) with surgical intervention (p-value = 0.130).

## DISCUSSION

This study allowed, besides knowing the profile of the sample studied, to establish its association with the clinical outcomes after evaluation and/or intervention in suspected or confirmed cases of CVA or TIA. It was also possible to attest that there was a higher death rate among the cases with diagnoses of hemorrhagic stroke than among the ischemic stroke found in the sample.

The gender and age variables in this study behaved similarly to other findings in the literature, in which no significance was observed when comparing male and female genders, but there was a tendency for the presence of CVA in elderly people.<sup>5</sup> Advanced age, according to the literature, has its risk factor related to the increased fragility of the blood vessel walls, a fact that favors its rupture in hemorrhagic events.<sup>5,9</sup>

**Table 1** – Characterization of attendances by confirmed and unconfirmed CVA diagnosis. Natal, RN, Brazil, 2019

Variables	Diagnosis of CVA				Total		p-value †	
	Confirmed		Not Confirmed		n	%		
	n	%	n	%				
Gender	Male	10	20	9	18	19	38	0,944
	Female	16	32	15	30	31	62	
Age Group	< 60 years	5	10	9	18	14	28	0,151
	≥ 60 years	21	42	15	30	36	72	
Attendance Hours	Daytime	18	36	17	34	35	70	0,902
	Nighttime	8	16	7	14	15	30	
	Sunday	3	6	5	10	8	16	
	Monday	5	10	2	4	7	14	
Attendance day	Tuesday	1	2	1	2	2	4	0,890
	Wednesday	2	4	3	6	5	10	
	Thursday	9	18	8	16	17	34	
	Friday	2	4	1	2	3	6	
	Saturday	4	8	4	8	8	16	

**Source:** Prepared by the authors, December 2019.

**Caption:** †Pearson's chi-square test.

**Table 2** – Association between outcomes of attendances of confirmed and unconfirmed CVA cases. Natal, RN, Brazil, 2019

Variables	Diagnosis of CVA				Total		p-value †	
	Confirmed		Not Confirmed		n	%		
	n	%	n	%				
Outcome at the ER	Discharge	-	-	20	40	20	40	<0,001
	Hospitalization	26	52	4	8	30	60	
Final Outcome	Discharge	21	42	24	48	45	90	0,051
	Death	5	10	-	-	5	10	

**Source:** Prepared by the authors, December 2019.

**Caption:** †Fisher's exact test.

**Table 3** – Association between final outcome of suspicious case attendances, type of CVA and medical approach. Natal, RN, Brazil, 2019

Variables	Final Outcome				Total		p-value †	
	Discharge		Death		n	%		
	n	%	n	%				
Diagnosis of CVA	Ischemic	16	32	2	4	18	36	0,001
	Hemorrhagic	2	4	3	6	5	10	
	TIA	3	6	-	-	3	6	
	Not Confirmed	24	48	-	-	24	48	
Medical Approach	Surgery	1	2	1	2	2	4	0,130
	Thrombectomy	1	2	-	-	1	2	
	Thrombolysis	1	2	-	-	1	2	
	Conservative Conduct	42	84	4	8	46	92	

**Source:** Prepared by the authors, December 2019.

**Caption:** †Pearson's chi-square test.

Regarding the days of the occurrence of cases, a pattern observed in other studies was not found. The predominance of daytime attendance can be explained by the clinical characteristic of CVA, since the lowered level of consciousness, a warning sign for CVA, can be easily confused with nocturnal sleep.<sup>14</sup> Family members' and caregivers' perception of the signs may be impaired in patients who are essentially unreachable, such as people with cognitive deficits.<sup>15</sup>

In the initial care in the ER, a considerable number of discharges were observed. Regarding this data, it is noteworthy that the researched service does not have a stroke care protocol already implemented. Therefore, there is the risk of underdiagnosis, if some conduct is not implemented by the medical professional, leading to early or inappropriate discharge.<sup>5</sup>

As a way to mitigate the possibility of failures in the identification process of suspected cases of CVA, several services already use protocols and tools implemented in their routine. One of them is the Glasgow Coma Scale, currently widespread in general neurological assessment and comprises the assessment of the quality of the patient's ocular, verbal, motor, and pupil response.<sup>16</sup>

Another tool is the Cincinnati scale, which proposes to direct three commands to the patient (smile, repeat a sentence, and raise your arms). Lip rhyme deviation observed in smiling, the perception of stuttered speech, and the inability to sustain at least one of the arms are positive signs for this scale. When only one

of them is present, the chance that the professional is facing a case of CVA is higher than 70%.<sup>17</sup>

Despite this, it is known that even though there are classic and frequent signs and symptoms associated with stroke, it can be an injury that is difficult to identify in some cases.<sup>15</sup> Another important point of the service is that there is no neurologist in person for the first care, which can cause inadequate diagnosis or unnecessary delay in the approach to the patient.<sup>18</sup>

In this sense, it is extremely important to control and measure the times of assistance until the risk classification, medical care, and the performance of cranial CT scan. Thus, it allows the establishment of goals to be contemplated and thus enable a timely and correct approach.<sup>19</sup>

Among the patients who were admitted for follow-up care in this study, we observed a high death rate, which was caused by the diagnosis of ischemic stroke, with higher predominance and lower proportion of deaths, and hemorrhagic stroke, which despite the lower percentage of diagnoses, showed a higher proportion of deaths. These findings meet and corroborate the national and international epidemiology, which predicts greater severity and lethality for hemorrhagic events.<sup>19-21</sup>

Regarding the approaches adopted, we highlight the high proportion of patients who had a conservative conduct, i.e., no intervention was performed with the aim of treating the cause of the CVA, even with a confirmed diagnosis. However, this may

have occurred due to the extended time between the onset of symptoms and the effective arrival of the patient to the service. As already mentioned, this time interval, which may contraindicate some approaches and interventions, is also related to the eventual lack of knowledge of the professional, patient, their families or caregivers about the disease, its warning signs and what should be done.<sup>22,23</sup>

Although mortality caused by CVA is the main concern, motor and functional sequelae and psychological disturbances generated by the condition of physical dependence are also a serious problem.<sup>2</sup> It is emphasized that the diseases secondary to the CVA, exercise in health services greater demand for clinical treatment, due to infections, pressure injuries and other episodes of obstructive nature, mostly with long hospitalization periods.<sup>15,24</sup>

As limitations of the study, we point out the small sample, with little inferential power, since there was a considerable disposal of medical records for this reason. This caused the sample obtained to be below the stipulated in the sample test. However, the population estimate used as a parameter for the calculation may have presented the same number of problems as in the previous period and, therefore, would have caused a similar number of disposals. This analysis was not performed by the researchers.

## CONCLUSION

The present research demonstrated, in the sample studied, the association between the diagnosis in patients with suspected CVA and its clinical outcome, which had hospital discharge as the main outcome, but with a high percentage of deaths among the attendances with hospitalization. In this sense, the hypothesis proposed in the study was accepted.

The need for implementation and standardization of care for suspected and confirmed cases of CVA was reported. Its validation will surely bring benefits to the services, such as reduction of care costs, shorter time of hospitalization for the patient, as well as the preservation of the patient's quality of life, even after such a severe event and clinical repercussion, which should be measured in other clinical or longitudinal studies.

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