Stroke: epidemiology and outcomes

Acidente Vascular Cerebral: epidemiologia e desfechos

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ABSTRACT

Objective: To determine the frequency of mortality, length of stay and nosocomial pneumonia outcomes, as well as their distribution according to predictor variables, in stroke patients treated at the emergency room of a tertiary hospital. Methods: A retrospective cohort study, with a sample of patients attended between January 1 and December 31, 2018. Based on the data collected in the medical records, the sample was characterized. Therefore, the frequency of each outcome was checked, as well as its distribution according to the predictor variables. Results: The sample population consisted of 210 patients. The frequencies observed in death and nosocomial pneumonia were 17.6% and 17.1%, respectively. The general mean length of stay was 13.8 ±12.9 days. Statistically significant differences were observed both in the occurrence of nosocomial pneumonia and atrial fibrillation (AF); days of hospitalization in intensive care unit; total days of hospitalization; orotracheal intubation; use of nasoenteral tube and surgical procedure secondary to stroke. Morever, there was also the relation of total time of hospitalization regarding dyslipidemia; orotracheal intubation; use of nasoenteral tube and surgical procedure secondary to stroke. Conclusion: The results found in the frequency of mortality, nosocomial pneumonia and mean total number of days of hospitalization are comparable with other Brazilian studies. However, it is possible to optimize the time of care provided for patients who arrive in the emergency room. In addition, the decrease of hospitalization days in dyslipidemic patients and the increase of nosocomial pneumonia in AF patients require further studies to verify such findings.

Keywords: stroke; epidemiology; emergency service; pneumonia; mortality.

RESUMO

Objetivo: Averiguar a frequência dos desfechos mortalidade, tempo de internação e pneumonia nosocomial, bem como sua distribuição de acordo com variáveis preditoras, em pacientes vítimas de acidente vascular cerebral (AVC) atendidos na emergência de um hospital terciário. Métodos: Estudo de coorte retrospectiva, com uma amostra de pacientes atendidos entre 1º de janeiro e 31 de dezembro de 2018. Com base nos dados coletados em prontuário, a amostra foi caracterizada. Desta forma, foi verificada a frequência de cada desfecho e sua distribuição conforme as variáveis preditoras. Resultados: A população da amostra foi de 210 pacientes. A frequência observada em óbito e pneumonia nosocomial foi de 17,6% e 17,1%, respectivamente. O tempo médio geral de internação foi de 13,8 ±12,9 dias. Foram observadas diferenças estatisticamente significativas, tanto na ocorrência de pneumonia nosocomial quanto a fibrilação atrial (FA); dias de internação em unidade de terapia intensiva; total de dias de internação; intubação orotraqueal; uso de sonda nasoenteral e procedimento cirúrgico secundário ao AVC. Além disso, verificou-se também a relação de tempo total de internação quanto à dislipidemia; intubação orotraqueal; uso de sonda nasoenteral e procedimento cirúrgico secundário ao AVC. Conclusão: Os resultados encontrados na frequência de mortalidade, pneumonia nosocomial e média do número total de dias de hospitalização são comparáveis com outros estudos brasileiros. Entretanto, é possível otimizar o tempo de atendimento dos pacientes que chegam ao pronto-socorro. Ademais, a diminuição dos dias de hospitalização em pacientes dislipidêmicos e o aumento da pneumonia nosocomial em pacientes com FA necessitam mais estudos para verificar tais achados.

Palavras-chave: acidente vascular cerebral; epidemiologia; serviço de emergência; pneumonia; mortalidade.

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INTRODUCTION

Stroke is a disease that results in sudden neurological deficits. It can be classified etiologically in two subtypes: ischemic stroke (IS) and hemorrhagic stroke (HS). Ischemic stroke, the most prevalent subtype, occurs due to ischemic and infarct areas of regions that had their arterial blood flow suppressed while the hemorrhagic one presents blood overflow to the cerebral parenchyma (1).

IS can be classified as thrombotic or embolic and is caused by obstruction of the artery responsible for supplying some region of the brain. Of the total, 85% of stroke cases are ischemic, whereas the others are divided between intraparenchymal and subarachnoid hemorrhage (1). Mortality in HS can reach half of the cases, while in IS it is close to 14% (2).

Worldwide, stroke is the second greatest cause of mortality. In Brazil, statistics indicate that the disease is responsible for about 100,000 deaths annually in adults, being the leading cause of deaths and disabilities in the country (2).

The risk factors which are more related to stroke are: advanced age, life habits (smoking and alcoholism), family history, socioeconomic conditions and comorbidities (diabetes *mellitus* - DM, high blood pressure (HBP), heart diseases, obesity) (3-5).

After basic life support, one must differentiate whether the stroke is ischemic or hemorrhagic. For this, it is necessary to request a brain computed tomography (CT) without contrast. Severity assessment protocols for stroke patients such as the National Institute of Health Stroke Scale - NIHSS and the Alberta Stroke Program Early CT Score - ASPECTS should be used in the care and are related to the decrease of morbidity and mortality (6). After the differentiation between IS and HS, it should be noted the treatment. The treatment can be classified in 6 different types of therapy: clinical support, intravenous (IV), thrombolysis - endovascular (EV) revascularization, antithrombotic treatment, neuroprotection and centers specialized in stroke and rehabilitation (7). The speed at the beginning of the treatment is determinant for a better clinical outcome of stroke patients. (8).

The average length of stay of stroke patients may vary according to the severity of the disease. Complications related to the patient's condition also influence the length of hospitalization, as in the case of nosocomial lung infection, which can affect up to 1/5 of hospitalized patients (9), and directly impacts the length of hospitalization and the cost of treatment (10,11).

The objective of this research was to describe the frequency of mortality, length of stay and nosocomial pneumonia outcomes and verify their distribution according to predictor variables.

METHODS

The present work is a retrospective cohort study. It was conducted at Hospital São Vicente de Paulo (HSVP), in the city of Passo Fundo, RS - Brazil. The hospital provides high complexity care, is the largest in the city, with over 700 beds. It is a reference for approximately two million residents of the northern macro-region of the state of Rio Grande do Sul (12).

The study population consisted of patients of both sexes, aged at least 18 years old, treated for suspected stroke in the emergency of the referred hospital. The intentional sample included all those diagnosed with IS and intraparenchymal HS in the period of 01/01 to 12/31/2018. Participants were located by tracking medical records using the International Classification of Diseases ICD-10 I61 - intracerebral hemorrhage; ICD-10 I63 - cerebral infarction and ICD-10 I64 - stroke, not specified as hemorrhagic or ischemic.

Data collection from medical records included: sex; age; skin color; origin; health insurance; marital status; schooling; employment situation; comorbidities (previous stroke, DM, HBP, dyslipidemia, nutritional status, coronary artery disease (CAD) and AF); subtype of stroke (IS or HS); regular use of anticoagulants and antiplatelet agents and lifestyle habits (smoking and drinking). The Body Mass Index (BMI) was calculated from the weight and height recorded in medical records, using the formula Weight/Height². Afterwards, they were categorized by age (20-59 years old - adults and over 60 years old - elderly) and classified according to the following BMI values: Adults - normal weight: 19 to 24.9; overweight: 25 to 29.9 and obesity: ≥ 30. Elderly - underweight: ≤ 22; eutrophy: 22.1 to 26.9 and overweight: ≥ 27, as recommended by the Ministry of Health (13).

It was also verified whether there were an evaluation by the NIHSS score at hospital admission and by ASPECTS. In addition, time from symptom onset to hospital admission, time between hospital admission until the first neuroimaging exam was performed, time known as door-to-needle (which in stroke cases represents the period between hospital admission and the beginning of thrombolytic infusion), length of hospital stay (broken down between ward and intensive care unit - ICU), incidence of nosocomial pneumonia, use of nasoenteral tube, orotracheal intubation, surgical procedures secondary to stroke and in-hospital mortality.

The data were transcribed double entered and validated in a bank created in EpiData, version 3.1; and statistical analyzes were carried out in the PSPP (both freely distributed). The analysis comprised frequency distribution of categorical variables, measures of central tendency and dispersion of numerical variables, frequency of outcomes of interest - mortality, length of hospital stay and nosocomial pneumonia - and their distribution according to predictor variables (significance of 5%).

This study was part of a larger research project registered with the Ethics Committee in Research with Human Beings of the Federal University of Fronteira Sul by CAAE 85587916.2.0000.5564 and approved under the number 2,752,284, in July 3, 2018. Thus, the ethical conduct of this project was supported by the one already assigned to the umbrella project.

RESULTS

When checking the frequency of deaths in stroke patients, a total of 17.6% of mortality was observed, being higher in cases of HS (21.3%) compared to IS (16.6%). The frequency of nosocomial pneumonia was 17.1% and the mean hospital stay was 13.8 ±12.9 days. The mean length of stay in ICU was 10.9 ±8.4 days.

Table 1 describes the types of strokes and the sociodemographic characteristics of the patients. Table 2 informs the frequencies of comorbidities, regular use of drugs, hospital procedures, use of tobacco and alcohol and nutritional status, in addition to the NIHSS and ASPECTS scores. Table 3 shows the average age among patients. The mean time from the beginning of symptoms to hospital admission, between admission until the first neuroimaging examination and the time of the patient's arrival at the hospital until the beginning of thrombolytic infusion. In Table 4, a statistically significant difference can be observed in the occurrence of nosocomial pneumonia regarding AF, days of ICU stay, total of days of hospitalization days, orotracheal intubation, use of nasoenteral tube and surgical procedure secondary to stroke. In Table 5, a statistically significant difference can be verified in the occurrence of total hospital stay regarding dyslipidemia, orotracheal intubation, use of nasoenteral tube and surgical procedure secondary to stroke.

Regarding the occurrence of intra-hospital mortality for strokes in general, there was no statistically significant difference regarding the predictor variables (data not shown).

DISCUSSION

The frequency of IS in the study population was 77.6%, within the values found in the literature (72.9 to 86%) (1.2.5.14). The other cases were HS. The frequency of intra-hospital deaths found was 17.6%, higher than the school hospital in Minas Gerais - MG, 12.7% (2) and the University Hospital of the University of São Paulo, 14.5% (15). However, another study conducted in the city of Fortaleza obtained a mortality rate of 21.9%. The HSVP is a reference for many municipalities in the region, which refer their critically ill patients, while patients with discrete conditions can be treated in the municipalities of origin. This condition can cause bias in the mortality rate of the hospital.

The incidence of nosocomial pneumonia was 17.1%, a value above those described in a European study, which analyzed a total of 9238 patients and found an incidence of 11.7% (16), and a systematic review with meta-analysis performed in several countries, which found 14.3% of affected (17). In Brazil, a study in hospitals in the city of Fortaleza - Ceará (CE), found a frequency of 17.6%, close to that found in HSVP (14), which demonstrates a small regional variation.

When relating nosocomial pneumonia with the other variables, we observed a statistically significant increase in the incidence of AF. One hypothesis is that patients with stroke and previous AF have worsened critical status, so they would be more exposed to hospital infections. It was also found that there is statistical significance between nosocomial pneumonia and length of stay in ICU and total length of hospital stay. Stroke victims tend to have a higher risk of bronchoaspiration (16-18) and, in case of nosocomial lung infection, the longer the patients will need hospitalization. In addition, they may present invasive treatment needs and become more exposed to infectious agents. In this sense, statistically significant relations were observed between nosocomial pneumonia and the use of a nasoenteral tube, orotracheal intubation and a surgical procedure secondary to stroke.

The mean hospital stay was 13.8 ±12.9 days, higher than that found in the school hospital in Minas Gerais (9.5 ±12.2 days) (2), but lower than that found in the Ceará study (15.4 ±20.1 days) (14). These data reflect a certain equity among the Brazilian regions, despite the socio-cultural differences that the country possesses. The diversity in the design of the studies cited may also be the cause of variations in the means found.

When verifying the total time of hospital stay with the variables of this study, it was observed that there was a statistically significant difference regarding dyslipidemia. Dyslipidemic patients had shorter length of stay. As dyslipidemics could be making use of statins, these drugs could be related to a shorter hospitalization time.

As described in the literature, a high prevalence of comorbidities (2-5,14,16,19-27) and social factors (5,28) associated with stroke was observed. The most affected gender was the male with 56.2% of the population. The mean age was 65.7 ±14.1 years, with 69.5% of patients aged >59 years. Most of the hospitalization (84.2%) were funded by Brazilian Public Health System (SUS). Low schooling level was evident as an important risk factor. Patients who did not finish elementary school total 71.4% of the sample and almost half of the patients were from other municipalities (48.1%), which possibly contributed to a delay in attending this population.

The most prevalent chronic disease was HBP, with 70% of the patients known to be hypertensive. DM had a prevalence of 32.9%, dyslipidemia, 24.8%; AF represented 14.3%; and CAD, 18.1% of the patients. The use of platelet antiaggregant reached 23.8% of the cases while the use of anticoagulants was 7.6%. History of previous stroke represented little more than a fifth of those assisted. Smoking and alcohol consumption were high in this population, with almost three times more smokers than alcoholics, which was 11.0%. Both tobacco and alcohol consumption are related to a higher frequency of stroke in male individuals, due to the higher consumption by men (27). The overweight/obesity in the adults was 70.2% and in the elderly people, the overweight was 42.4%, indicating that the overweight can be related to stroke. A study conducted in Santa Catarina, which evaluated overweight and obesity in patients with stroke in five cities of different Brazilian states, showed that 64% of the patients were overweight (4), data that reinforce the importance of preventive measures to obesity.

The mean time from the onset of symptoms to hospital admission was 377.6 ±417.6 minutes (6 hours and 17 minutes); and the mean time they took to perform the first neuroimaging examination from hospital admission was 175.6 ±197.2 minutes (2 hours and 55 minutes). A prospective cohort study performed in hospitals of Fortaleza -CE showed a mean time of onset of symptoms until hospital admission of 12.9 hours (12 hours and 54 minutes); and a mean time of hospital admission until the first neuroimaging examination of 3.4 hours (3 hours and 24 minutes) (14). The Ministry of Health establishes that the neuroimaging exam is ideally performed and interpreted within 45 minutes of hospital admission (29). This delay in performing a mandatory examination to define diagnosis and conduct may be a triggering factor for a worse prognosis, since the therapeutic window for the use of thrombolytic IV for stroke is 4 hours and 30 minutes. The causes for the delay in performing the brain CT without contrast can be several. Among the possibilities are the lack of structure for the high demand of patients, failure in screening with incorrect classification of the patient's severity, delay in the first medical evaluation or late diagnosis; unprepared or overloaded professionals and the lack of a specific center attached to the hospital for the care of these patients.

Regarding the use of NIHSS and ASPECTS scores, it was observed that, in most of the assistances, these scores were not used. Therefore, patients missed the opportunity to use these tools, which are capable of improving clinical outcomes.

This study had as a limiting factor the dependence on the adequate filling of medical records by the professionals involved, since it is a retrospective analysis of data.

CONCLUSION

The frequencies of mortality, nosocomial pneumonia and average of the total number of days in this study are comparable with others Brazilian studies. Nevertheless, the data show that it is possible to optimize the time of care of patients who arrive at the emergency room, as advocated by the Ministry of Health. These measures probably had on impact the observed outcomes. It is worth noting that simple resources such as the NIHSS score and the ASPECTS score are still underused by the hospital in question. In addition, the decrease of hospitalization days in dyslipidemic patients and the increase of nosocomial pneumonia in patients with AF, with statistically significant values, require additional studies to confirm such findings.

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Table 1. Description of types of stroke and sociodemographic characteristics of patients seen in the emergency room of a tertiary hospital in Passo Fundo city, RS, 2018 (n=210).

Variables	n	%
Stroke Type		
IS[1]	163	77,6
HS[2]	47	22,4
Agreement (n = 203)		
Health Unic System	171	84,2
Health insurance / private	32	15,8
Origin (n = 208)		
Passo Fundo city	107	51,9
Another location	101	48,1
Sex		
Male	118	56,2
Female	92	43,8
Age (full years)		
18-59	64	30,5
> 59	146	69,5
Skin color		
White	185	88,1
Not white	25	11,9
marital status		
Not married	20	9,6
Married / stable union	134	64,4
Widower	42	20,2
Divorced	12	5,8
Education		
Illiterate	13	6,2
Incomplete elementary school	137	65,2
Complete primary education	21	10,0
Incomplete high school	6	2,9
Complete high school	21	10,0
Incomplete / complete higher education	12	5,7
Employment situation		
Active	81	38,5
Retired	119	56,7
Other	10	4,8

Ischemic stroke[1]; Hemorrhagic stroke[2]

Table 2. Frequencies of comorbidities, regular use of anticoagulant and antiplatelet drugs, performance of hospital procedures, use of tobacco and alcohol and nutritional status in stroke victims, seen in the emergency of a tertiary hospital in Passo Fundo city, RS, 2018 (n=210).

Variables		n	%
Previous stroke	Yes	44	21,0
HBP[1]	Yes	147	70,0
DM[2]	Yes	69	32,9
Dyslipidemia	Yes	52	24,8
AF[3]	Yes	30	14,3
CAD[4]	Yes	38	18,1
Regular use of anticoagulant	Yes	16	7,6
Regular use of antiplatelet agents	Yes	50	23,8
Orotracheal intubation	Yes	42	20,0
Use of nasoenteral tube	Yes	74	35,2
Surgical procedure secondary to stroke	Yes	67	31,9
NIHSS[5] on hospital admission	Yes	18	8,6
ASPECTS[6]	Yes	3	1,4
Smoking	Yes / ex-smoker	68	32,4
Ethics	Yes / ex-drinker	23	11,0
Adult nutritional status (n = 57)			
Eutrophy		17	29,8
Overweight / obesity		40	70,2
Elderly nutritional status (n = 132)			
Low weight		17	12,9
Eutrophy			
Overweight		56	42,4

High Blood Pressure[1]; Diabetes Melittus[2]; Atrial Fibrillation[3]; Coronary Artery Disease[4]; National Institute Health Stroke Scale[5]; Alberta Stroke Program Early CT Score[6].

Table 3. Average age, number of days of hospitalization and time related to the care and treatment of stroke victims in the emergency of a tertiary hospital in Passo Fundo city, RS, 2018.

	n	Minimum	Maximum	Average	Deviation Standard
Age (in years)	210	23	97	65,7	14,1
Time from symptom onset to hospital admission (minutes)	117	7	2037	377,6	417,6
Hospital admission time until first neuroimaging exam (minutes)	171	1	1303	175,6	197,2
Hospital admission time to thrombolysis (minutes)	4	56	222	113,5	74,5

Table 4: Distribution of nosocomial pneumonia in stroke victims treated at the emergency room of a tertiary hospital in Passo Fundo city, RS, 2018 (n=210).

Variables	Nosocomial pneumonia				p*
	Yes		Not		
	n	%	n	%	
Atrial fibrillation					
Not	26	14,4	154	85,6	0,011
Yes	10	33,3	20	66,7	
Days in ICU[1]					
1-10 days	7	35,0	13	65,0	0,016
> 10 days	11	78,6	3	21,4	
Total days of hospitalization					
1-10 days	5	4,3	111	95,7	<0,001
> 10 days	31	33,0	63	67,0	
Orotracheal intubation					
Not	13	7,7	155	92,3	<0,001
Yes	23	54,8	19	45,2	
Use of nasoenteral tube					
Not	1	0,7	135	99,3	<0,001
Yes	35	47,3	39	52,7	
Surgical procedure secondary to stroke					
Not	18	12,6	125	87,4	0,010
Yes	18	26,9	49	73,1	

Chi-square test *; Intensive Care Unit[1]; Stroke.

Table 5: Distribution of the total length of hospital stay in stroke patients treated at the emergency room of a tertiary hospital in Passo Fundo city, RS, 2018 (n=210).

Variables	Total length of stay				p*
	1-10 days		> 10 days		
	n	%	n	%	
Dyslipidemia					
Not	81	51,3	77	48,7	0,044
Yes	35	67,3	17	32,7	
Orotracheal intubation					
Not	100	59,5	68	40,5	0,012
Yes	16	38,1	26	61,9	
Use of nasoenteral tube					
Not	90	66,2	46	33,8	<0,001
Yes	26	35,1	48	64,9	
Surgical procedure secondary to stroke					
Not	94	65,7	49	34,3	<0,001
Yes	22	32,8	45	67,2	

Chi-square test *