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ORIGINAL ARTICLE

Time series of mortality from stroke in the adult population residents of the State of Amazonas from 2000 to 2021

Iago Sales Orlandi[a], Andressa Braz Carlini Pestana[b], Breno Lage Pereira de Aguiar[a], Aline Bergamini Effgen Sena[a], Paulo André Stein Messetti[c], Francisco Naildo Cardoso Leitão[e], Valdelias Xavier Pereira[d], Hugo Macedo de Souza Jr[d], Orivaldo Florencio de Sousa[f,g], Luiz Carlos de Abreu[h]

[a]Graduação em Nutrição, Departamento de Educação Integrada em Saúde, Universidade Federal do Espírito Santo. Vitória, Espírito Santo, Brasil;

[b] Programa de Pós-Graduação em Saúde Coletiva, Universidade Federal do Espírito Santo. Vitória, Espírito Santo, Brasil;

[c]Professor do Programa de Pós-Graduação em Políticas Públicas e Desenvolvimento Local da Escola Superior de Ciências da Santa Casa de Misericórdia de Vitória. Vitória, Espírito Santo, Brasil.

[d]Centro Universitário FMABC, Santo ANdré, São Paulo, Brasil;

[e]Programa de Pós-Graduação em Saúde Coletiva, Universidade Federal do Espírito Santo. Vitória, Espírito Santo, Brasil.;

[f]Centro de Ciências da Saúde e Desportos, Universidade Federal do Acre. Vitória, Espírito Santo, Brasil.

[g]Programa de Pós-Graduação e em Nutrição e Saúde, Universidade Federal do Espírito Santo. Vitória, Espírito Santo, Brasil;

[h]Professor Titular-Livre junto à Universidade Federal do Espírito Santo, Orientador Pleno do Programa de Ciências Médicas da Faculdade de Medicina da Universidade de São Paulo, Brasil

Corresponding author
luizcarlos@usp.br

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Abstract

Introduction: stroke is one of the leading causes of mortality in Brazil and worldwide, however, the literature lacks studies analyzing stroke mortality in the state of Amazonas.

Objective: to analyze stroke mortality in the state of Amazonas from 2000 to 2021.

Methods: the study is an ecological time-series study with secondary data from 2000 to 2021 obtained from the Department of Health Information and Informatics of the Unified Health System (DATASUS) for the state of Amazonas.

Results: the year 2021 recorded the highest number of stroke deaths over the analyzed historical series, with a total of 851 deaths. The mortality rate in 2021 was the highest compared to 2015 through 2021, reaching 31.84. The male sex had a higher mortality rate compared to the female sex for most years. The mortality rate was higher for individuals aged over 60. The mortality rate among people aged 80 or older has been increasing, with an Annual Percent Change (APC) of 2.34% (95% CI: 0.18; 4.54). For the entire population, as well as the age groups 20-29 and 30-39, the mortality rate remained constant.

Conclusion: the mortality rate for the total population remained stable. For individuals over 80 years old, there was a growth trend.

Keywords: stroke, mortality, epidemiology.

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Authors summary

Why was this study done?
Stroke (AVC) is one of the leading causes of mortality both in Brazil and globally. Despite this, there is a scarcity of epidemiological studies on stroke across various Brazilian states. Therefore, this study was conducted to analyze stroke mortality in the state of Amazonas, aiming to provide data that can contribute to the formulation of effective health policies and strategies for disease control

What did the researchers do and find?
We conducted an ecological time series study using secondary data from DATASUS, covering the adult population of Amazonas from 2000 to 2021. The study analyzed total deaths and mortality rates for the entire population, as well as by sex and age group categories. The analysis revealed stability in overall mortality rates and the age groups of 20-29 years and 30-39 years. However, we observed a significant increase in mortality rates in the age group of 80 years and older. Most deaths occurred in individuals aged 60 years and older, with men consistently showing higher mortality rates than women.

What do these findings mean?
While the stroke mortality rate remained stable for the general population, individuals aged 80 years and older experienced a high number of total deaths and a growing trend in stroke mortality. These findings emphasize the necessity for interventions and healthcare strategies specifically aimed at preventing and managing strokes, particularly among the elderly.

Highlights
There is an increasing trend in stroke mortality rates in Amazonas for the age group of 80 years and older.
In most years, the mortality rate among men was higher than that among women.
Mortality rates were highest in age groups 60 years and older.

INTRODUCTION

Stroke is a cerebrovascular pathology characterized by an immediate neurological deficit due to an ischemic or hemorrhagic brain injury[1]. It is one of the main causes of death and disability worldwide, affecting millions of people annually[2,3]. This condition causes a significant burden on health systems and social resources, requiring effective prevention, treatment, and rehabilitation interventions[4,5].

The occurrence and mortality of stroke vary according to age groups, with higher incidence and mortality generally observed as age increases[6]. Sex, race, and family history are also non-modifiable risk factors for the disease[6,7]. Additionally, individuals with diabetes, hypertension, obesity, dyslipidemia, a high degree of physical inactivity, smoking, alcohol abuse, and stress are more susceptible to suffering a stroke[6,7].

Each year, about 17 million cases of stroke occur globally[3]. Estimates suggest that 1 in 4 people will suffer a stroke during their lifetime[8]. Annually, more than 6 million deaths from stroke are reported, with most associated with ischemic stroke[9]. These figures highlight the significant mortality burden attributed to stroke and underscore the importance of effective preventive measures and treatments to mitigate this global impact[3].

In Latin America, stroke also has a high incidence and is among the leading causes of death[3]. Given this scenario, in recent decades there has been an advance in Brazil's stroke control policies[10]. However, despite the downward trend in the mortality rate in recent years, this decline is not evenly distributed across all regions of the country[11,12].

Brazilian states with better economic development show a similar downward trend, while the same results are not evident in poorer territories[13,14]. There is speculation that socioeconomic differences and differences in access to health services in different states may influence the number of deaths from stroke.

The state of Amazonas has a low level of socioeconomic development and faces significant health challenges[15,16]. The vast geographic extension, low demographic density, limited regionalization of health care, and the scarcity of economic resources contribute to disparities in access to health services[15]. These conditions can compromise the effectiveness of prevention measures, diagnosis, and adequate treatment of pathologies such as stroke[15,17]. Despite this, the literature lacks studies that evaluate the epidemiology of stroke in the state. Therefore, this study aims to analyze stroke mortality in the adult population of Amazonas state between 2000 and 2021.

METHODS

Study design

The study is an ecological time-series analysis based on secondary data from the adult population of Amazonas, Brazil, from 2000 to 2021.

Location and population studied

The study considered data related to the population aged 20 to 80 years or older, residing in Amazonas, Brazil, from 2000 to 2021. Amazonas, located in the Northern region, is the largest state in Brazil by territorial extension, covering 1,559,255.881 km². It has a population of 3,941,175 inhabitants and a population density of 2.53 inhabitants/km² [16].

Data source and extraction

All data were extracted from the database of the Department of Health Information and Informatics of the Unified Health System (DATASUS) of the Ministry of Health for the place of residence from 2000 to 2021 for the total population and stratified by sex and age group. The DATASUS information is publicly and freely accessible.

The population data used in this study came from the "Study of Population Estimates by municipality, sex, and age from 2000 to 2021" prepared by the Ministry of Health based on the Brazilian Population Census of 2022. These data are available through the DATASUS database at the following address: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?ibge/cnv/popsvsbr.def.

Stroke mortality data were extracted from the DATASUS website at the following address: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sih/cnv/nito.def. All death information incorporated into DATASUS originates from the Mortality Information System of the Ministry of Health.

Study variable

The study variable was death due to the cause of stroke occurring in residents of the state of Amazonas. Stroke was defined by the codes I60 (subarachnoid hemorrhage), I61 (intracerebral hemorrhage), I63 (cerebral infarction), and I64 (unspecified as ischemic or hemorrhagic), according to the International Classification of Diseases version 10. The occurrence of stroke has been determined for the entire population and stratified by sex (male and female) and age group (20 to 29 years, 30 to 39 years, 40 to 49 years, 50 to 59 years, 60 to 69 years, 70 to 79 years, and 80 years or older) for the calendar years between 2000 and 2021.

Statistics analysis

Data on stroke deaths for the total population, age groups, and sex were acquired using the file transfer system from the Department of Health Information and Informatics of the Unified Health System database to a comma-separated values (CSV) file format.

For each year from 2000 to 2021, the mortality rate per 100,000 inhabitants and the sex-specific mortality rate ratio were determined using Microsoft Office Excel. The mortality rate was obtained by dividing the number of deaths by the specific population, and the result was multiplied by 100,000. The sex-specific mortality rate ratio was estimated by dividing the male mortality rate by the female mortality rate annually[18].

Prais-Winsten regression was employed to analyze the trend of stroke mortality rates from 2000 to 2021 using Stata 17. The dependent variable was the mortality rate per 100,000 inhabitants, and the independent variable was the year. Analyses were conducted for the general population, with stratification by sex and age group: 20-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years, and 80 years and older. Autocorrelation was estimated using the adjusted Durbin-Watson method.

Annual percent change (APC) was calculated for each age group following procedures suggested by Antunes and Cardoso[19]. Briefly, dependent variables were initially logarithmically transformed. The Prais-Winsten regression was then used to estimate beta values and respective 95% confidence intervals (CI). Subsequently, APC and respective 95% confidence intervals (CI) were calculated using the formula: (-1 + 10β estimado) X 100. Models with p-values equal to or less than 5% were considered statistically significant.

Legal and ethical aspects of research

The present study utilized public domain and freely accessible databases. Therefore, submission to the Research Ethics Committee was not required.

RESULTS

Table 1 presents the number of deaths and mortality rates from stroke in the adult population of the state of Amazonas, Brazil, from 2000 to 2021. The year 2021 saw the highest number of deaths in the analyzed historical series, with a total of 851 deaths, including 422 in males and 429 in females. The mortality rate in 2021 was the highest between 2015 and 2021, reaching 31,84. The highest mortality rate observed during the entire period occurred in 2014, at 33,45.

Except in the years 2000, 2005, 2007, 2009, and 2021, men consistently exhibited higher mortality rates than women. The most significant disparity between the sexes occurred in 2010 when the male mortality rate was 18% higher. Additionally, for most years evaluated, the number of deaths was higher among males compared to females (table 1).

Table 1: Number of deaths and mortality rate from stroke in the adult population of the State of Amazonas, Brazil, from 2000 to 2021

	Deaths			Mortality rate*			Mortality Rate Ratio: Male / Female
	All	Male	Female	All	Male	Female	
2000	446	222	224	31.73	31.49	31.98	0.98
2001	449	235	214	30.72	32.06	29.38	1.09
2002	422	221	201	27.79	29.02	26.55	1.09
2003	410	208	202	26.01	26.31	25.70	1.02
2004	429	224	205	26.24	27.33	25.14	1.09
2005	475	217	258	28.05	25.56	30.55	0.84
2006	510	275	235	29.11	31.32	26.89	1.16
2007	472	229	243	26.07	25.24	26.91	0.94
2008	575	299	276	30.76	31.93	29.59	1.08
2009	522	244	278	27.07	25.27	28.88	0.88
2010	559	303	256	28.12	30.45	25.79	1.18

Continuation - Table 1: Number of deaths and mortality rate from stroke in the adult population of the State of Amazonas, Brazil, from 2000 to 2021

	Deaths			Mortality rate*			Mortality Rate Ratio: Male / Female
	All	Male	Female	All	Male	Female	
2011	615	324	291	30.06	31.67	28.45	1.11
2012	650	350	300	30.89	33.30	28.49	1.17
2013	633	324	309	29.26	30.01	28.51	1.05
2014	744	386	358	33.45	34.82	32.10	1.08
2015	715	370	345	31.27	32.49	30.06	1.08
2016	653	331	322	27.79	28.30	27.28	1.04
2017	649	339	310	26.87	28.22	25.53	1.11
2018	645	323	322	25.99	26.19	25.80	1.02
2019	685	361	324	26.90	28.54	25.29	1.13
2020	674	360	314	25.83	27.78	23.90	1.16
2021	851	422	429	31.84	31.81	31.87	1.00

Source: Developed by the authors, 2024, from the database; * Mortality rate per 100,000.

In 2021, the highest number of deaths occurred in five age groups: 20-29 years, 50-59 years, 60-69 years, 70-79 years, and 80 years or older. During this period, the highest number of deaths within specific age groups throughout the historical series was observed, with 289 deaths among individuals aged 80 years or older. This age group consistently showed predominance in absolute deaths, except from 2000 to 2004 and in 2006 and 2008 (table 2).

Table 2: Number of deaths by age group from stroke in the adult population of the State of Amazonas, Brazil, from 2000 to 2021

	Age groups						
	20 - 29 age	30 - 39 age	40 - 49 age	50 - 59 age	60 - 69 age	70 - 79 age	80 years old and over
2000	5	19	58	72	94	99	99
2001	8	15	43	77	97	111	98
2002	5	17	36	72	94	104	94
2003	5	17	41	73	76	99	99
2004	4	15	45	65	99	107	94
2005	7	23	48	74	90	114	119
2006	8	20	58	61	90	140	133
2007	6	18	42	72	79	124	131
2008	11	12	50	89	110	152	151
2009	7	19	50	74	87	128	157
2010	4	21	50	93	102	139	150
2011	4	16	52	93	105	157	188
2012	7	28	53	91	124	168	179
2013	5	25	54	103	109	142	195
2014	8	28	67	112	139	182	208
2015	11	24	51	88	137	157	247
2016	11	25	53	103	112	153	196
2017	11	23	56	89	116	144	210
2018	6	24	54	71	119	163	208
2019	6	20	68	100	127	169	195
2020	7	22	60	90	123	148	224
2021	14	23	63	104	142	216	289

Source: Developed by the authors, 2024, from the database.

The mortality rate increased with advancing age, being particularly pronounced in age groups above 60 years, with an even more significant value in individuals over 80 years old. Temporal analysis revealed periods of both increase and decrease in the mortality rate over time. In 2015, there was a notable peak in the mortality rate among individuals aged 80 and older (figure 1).

Only individuals aged 80 years or older showed an increasing trend, with an APC (Annual Percentage Change) of 2.34% (95% CI: 0.18; 4.54). In contrast, in the age groups of 40 to 49 years, 50 to 59 years, 60 to 69 years, and 70 to 79 years, a reduction in the mortality rate was observed over the historical series, with the most significant decrease occurring among individuals aged 50 to 59 years, with an APC of -6.27% (95% CI: -8.40; -4.09). Regarding the total population, other age groups, and sex, the APC of the mortality rate remained stationary (table 3).

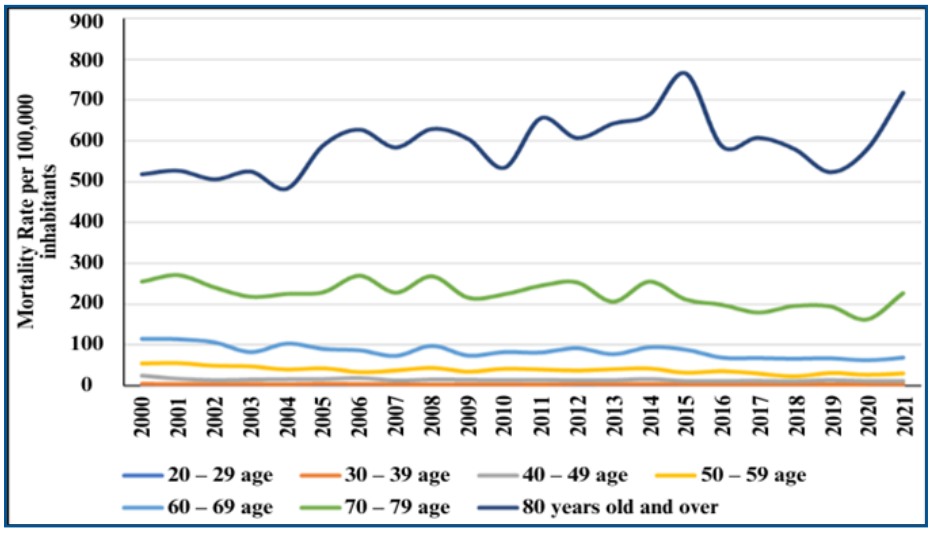

Figure 1: Stroke Mortality Rate by Age Group in the Adult Population of Amazonas state, Brazil, 2000 to 2021

Table 3: Annual percentage variation of stroke mortality rate by sex and age group in the population of Amazonas State, Brazil, from 2000 to 2021

	Beta	p	APC	(CI 95%)	Interpretation
All	-0.00045	0.909	-0.10	(-1.94 ; 1.77)	Stationary
Sex					
Male	0.00101	0.787	0.23	(-1.52 ; 2.01)	Stationary
Female	-0.00189	0.629	-0.43	(-2.26 ; 1.42)	Stationary
Grupo Etário					
20 – 29 age	0.01027	0.492	2.39	(-4.57 ; 9.86)	Stationary
30 – 39 age	-0.01137	0.089	-2.58	(-5.52 ; 0.44)	Stationary
40 - 49 age	-0.02108	≤ 0.001	-4.74	(-6.81 ; -2.61)	Decreasing
50 - 59 age	-0.02811	≤ 0.001	-6.27	(-8.40 ; -4.09)	Decreasing
60 - 69 age	-0.02269	≤ 0.001	-5.09	(-6.76 ; -3.39)	Decreasing
70 - 79 age	-0.01357	≤ 0.001	-3.08	(-4.66 ; -1.47)	Decreasing
80 years old and over	0.01004	0.035	2.34	(0.18 ; 4.54)	Increasing

Source: Developed by the authors, 2024, from the database. APC: Annual percentage variation

DISCUSSION

The mortality rate remained stable for both sexes in the age groups 20-29 years and 30-39 years, as well as for the total population. In contrast, there was an increase in the mortality rate among those aged 80 years old and over, while the other age groups showed a decrease. The male-to-female mortality rate ratio was consistently higher for men. The highest mortality rates occurred in the age groups 60 years and older. Between 2015 and 2021, the highest mortality rate occurred in 2021.

There is a global trend of decreasing stroke mortality rates[20]. In the Southern and Southeastern regions of Brazil, between 2008 and 2018, there was a decrease in mortality rates[13]. A study that evaluated the trend of stroke mortality rates in Brazil from age 30 onwards, between 2000 and 2009, showed a reduction in mortality rates for individuals aged 30-39 years[21]. However, our study found that mortality rates remained stable for the total population and for the age groups 20-29 and 30-39, and increased for individuals over 80 years old in Amazonas.

The high stroke mortality rate in the state of Amazonas results from significant health challenges

experienced by the population. Centralization of services in Manaus, lack of access to specialized services in remote areas, shortage of qualified healthcare professionals, and structural inequities in the healthcare system undermine the regionalization process[15]. These factors may limit longitudinal monitoring of individuals, which is crucial for preventing and treating modifiable risk factors associated with stroke[22,23]. Additionally, they prolong access times to emergency services, potentially increasing the number of deaths[23].

Our results also revealed a higher stroke mortality rate among men compared to women in most years. Roni *et al*.[24] evaluated stroke mortality in the state of Pará and found a significant difference between sexes, with stroke mortality rates often higher among men. The causes of this disparity are multifaceted and may include social and cultural factors[25].

Advanced age is a risk factor for stroke mortality[20]. As observed in this study, numerous other research studies have shown higher mortality rates in age groups above 60 years[11,26]. This phenomenon can be explained by a combination of physiological factors related to aging itself and the presence of chronic diseases in this population[27].

Franceschi *et al.*[27] emphasize that aging is associated with chronic inflammation, structural and functional changes in blood vessels, oxidative stress, and mitochondrial dysfunction. Additionally, there is a higher prevalence of diabetes, hypertension, and heart disease among While the stroke mortality rate remained stable for the general population, individuals aged 80 years and older experienced a high number of total deaths and a growing trend in stroke mortality. This highlights the necessity for interventions and healthcare strategies aimed at stroke prevention and management, particularly among the elderly. These factors may contribute to a greater susceptibility to stroke.

Similarly to our findings, Djaló *et al*.[28] observed that the stroke mortality rate in 2021 exceeded the rate of the previous four years in Pernambuco. This increase can explained by the development of the COVID-19 pandemic, which negatively impacted patients with less severe strokes due to delays in hospital care, changes in treatment organization, ICU overload, and lower adherence to protocols[29,30]. Additionally, some studies suggest an increase in stroke incidence associated with COVID-19, although further research is needed to clarify the pathophysiology of this relationship[31].

The motivation for this research stemmed from the scarcity of studies on the epidemiological parameters of stroke in the state of Amazonas. Stroke is one of the leading causes of death and disability in Brazil and worldwide. The population of Amazonas faces unique challenges in accessing healthcare, which likely contributes to the high mortality rates in the region.

A stationary temporal trend was observed in the mortality rate for the general population, whereas individuals aged 80 years and older showed an increasing trend. These findings underscore the need for specific interventions and public policies to control stroke in the state, especially among elderly individuals aged 80 years and older.

The limitations of this study include the potential for errors, underreporting, and delays in data recording, which could influence the findings. However, it is crucial to note that the registration procedures in the Mortality Information System are standardized and conducted by trained professionals, minimizing the likelihood of mistakes[32]. Moreover, the robustness of the data mitigates the potential impacts of underreporting and delayed registrations.

Continuing to monitor the assessed indicators in the state and conducting new research to investigate the underlying factors behind the observed outcomes is imperative. Including other variables such as pre-existing medical conditions, family history of cardiovascular diseases, socioeconomic status, and access to healthcare is crucial for a more comprehensive evaluation. Future studies can explore these variables for a more detailed analysis of stroke mortality rates in Amazonas state.

CONCLUSION

This study showed a stable trend in mortality rates for the total population and the age groups 20-29 years and 30-39 years. However, individuals aged over 80 years showed an increasing trend in mortality rates. Most deaths occurred in individuals over 60 years old. Additionally, a disparity between sexes was evident, with men often exhibiting higher mortality rates.

Moving forward, closely monitoring these trends and developing specific public health strategies for vulnerable groups, especially elderly, is essential to reduce mortality in these populations. Furthermore, ongoing research into factors contributing to these disparities can help formulate more effective policies to improve the health and longevity of the population.

Author Contributions

Iago Sales Orlandi: participated in data analysis, discussion of results, writing and final version of the text; Andressa Braz Carlini Pestana: participated in data analysis, discussion of results and writing; Breno Lage Pereira de Aguiar: participated in data analysis and discussion; Aline Bergamini Effgen Sena: participated in data analysis and discussion; Paulo André Stein Messetti: participated in data analysis and discussion; Francisco Naildo Cardoso Leitão: participated in study design, data collection and evaluation, and statistical analysis; Orivaldo Florencio de Souza: participated in study design, data collection and evaluation, and statistical analysis; Luiz Carlos de Abreu: participated in study design.

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Conflicts of Interest

The authors have no conflict of interest in this work.

REFERENCES

1. Kobayashi A, Czlonkowska A, Ford GA, Fonseca AC, Luijckx GJ, Korv J, et al. European Academy of Neurology and European Stroke Organization consensus statement and practical guidance for pre-hospital management of stroke. Eur J Neurol [Internet]. 2018 Mar;25(3):425–33. Available from: http://dx.doi.org/10.1111/ene.13539
2. Esenwa C, Gutierrez J. Secondary stroke prevention: challenges and solutions. Vasc Health Risk Manag [Internet]. 2015 Aug 7;11:437–50. Available from: http://dx.doi.org/10.2147/VHRM.S63791
3. GBD 2021 Causes of Death Collaborators. Global burden of 288 causes of death and life expectancy decomposition in 204 countries and territories and 811 subnational locations, 1990-2021: a systematic analysis for the Global Burden of Disease Study 2021. Lancet [Internet]. 2024 May 18;403(10440):2100–32. Available from: http://dx.doi.org/10.1016/S0140-6736(24)00367-2
4. Sacco RL, Kasner SE, Broderick JP, Caplan LR, Connors JJB, Culebras A, et al. An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke [Internet]. 2013 Jul;44(7):2064–89. Available from: http://dx.doi.org/10.1161/STR.0b013e318296aeca
5. Campbell BCV, De Silva DA, Macleod MR, Coutts SB, Schwamm LH, Davis SM, et al. Ischaemic stroke. Nat Rev Dis Primers [Internet]. 2019 Oct 10;5(1):70. Available from: http://dx.doi.org/10.1038/s41572-019-0118-8
6. Goldstein LB, Adams R, Alberts MJ, Appel LJ, Brass LM, Bushnell CD, et al. Primary prevention of ischemic stroke: a guideline from the American Heart Association/American Stroke Association Stroke Council: cosponsored by the Atherosclerotic Peripheral Vascular Disease Interdisciplinary Working Group; Cardiovascular Nursing Council; Clinical Cardiology Council; Nutrition, Physical Activity, and Metabolism Council; and the Quality of Care and Outcomes Research Interdisciplinary Working Group: the American Academy of Neurology affirms the value of this guideline. Stroke [Internet]. 2006 Jun;37(6):1583–633. Available from: http://dx.doi.org/10.1161/01.STR.0000223048.70103.F1
7. Rangel DM, Feitosa AKN, Araújo FM, Pinheiro MC da S, Cidrão AA de L. The effects of the healthcare line in a stroke unit: three years' experience of a center in the Northeast of Brazil. Arq Neuropsiquiatr [Internet]. 2023 Aug;81(8):707–11. Available from: http://dx.doi.org/10.1055/s-0043-1770350
8. GBD 2016 Lifetime Risk of Stroke Collaborators, Feigin VL, Nguyen G, Cercy K, Johnson CO, Alam T, et al. Global, Regional, and Country-Specific Lifetime Risks of Stroke, 1990 and 2016. N Engl J Med [Internet]. 2018 Dec 20;379(25):2429–37. Available from: http://dx.doi.org/10.1056/NEJMoa1804492
9. World Health Organization - WHO [Internet]. Global health estimates: Leading causes of death; c2000-2019 [cited 2024 May 11]. Available from: https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-leading-causes-of-death.
10. Ministério da Saúde (BR). Portaria Nº 665, de 12 de abril de 2012. Dispõe sobre os critérios de habilitação dos estabelecimentos hospitalares como Centro de Atendimento de Urgência aos Pacientes com Acidente Vascular Cerebral (AVC), no âmbito do Sistema Único de Saúde (SUS), institui o respectivo incentivo financeiro e aprova a Linha de Cuidados em AVC [Internet]. Diário Oficial da União. 2012 Apr 13. [cited 2024 Jul 11]. Available from: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2012/PRT0665_12_04_2012.html
11. Araújo JP de, Darcis JVV, Tomas ACV, Mello WA de. Tendência da Mortalidade por Acidente Vascular Cerebral no Município de Maringá, Paraná entre os anos de 2005 a 2015. Int J Cardiovasc Sci [Internet]. 2018 [cited 2024 Jul 11];31(1):56–62. Available from: https://www.scielo.br/j/ijcs/a/k9nXmcKfW7WSwvtYP8rWsbf/abstract/?lang=pt
12. Moreira PVL, de Arruda Neta A da CP, Ferreira SS, Ferreira FELL, de Lima RLFC, de Toledo Vianna RP, et al. Coronary heart disease and stroke mortality trends in Brazil 2000-2018. PLoS One [Internet]. 2021 Sep 2;16(9):e0253639. Available from: http://dx.doi.org/10.1371/journal.pone.0253639
13. de Moraes Bernal H, de Abreu LC, Pinheiro Bezerra IM, Adami F, Takasu JM, Ji Young Suh JV, et al. Incidence of hospitalization and mortality due to stroke in young adults, residents of developed regions in Brazil, 2008-2018. PLoS One [Internet]. 2020 Nov 16;15(11):e0242248. Available from: http://dx.doi.org/10.1371/journal.pone.0242248
14. Almeida GT, de Carvalho BMM, Nunes JDC, dos Santos Rosa OM, Pires JAP, de Souza ACL, et al. Mortality from Cerebral Vascular Accident in Northeast Brazil, 2008-2018. RSD [Internet]. 2023 Mar 14 [cited 2024 Jul 11];12(3):e22912340301–e22912340301. Available from: https://rsdjournal.org/index.php/rsd/article/view/40301

15. Garnelo L, Sousa ABL, Silva C de O da. Health regionalization in Amazonas: progress and challenges. Cien Saude Colet [Internet]. 2017 Apr;22(4):1225–34. Available from: http://dx.doi.org/10.1590/1413-81232017224.27082016
16. Instituto Brasileiro de Geografia e Estatística - IBGE [Internet]. IBGE Cidades; c2022 [cited 2024 May 11]. Available from: https://cidades.ibge.gov.br/brasil/am/panorama
17. Mariosa DF, Dota EM, Gigliotti M, dos Santos-Silva EN. VULNERABILIDADE SOCIOAMBIENTAL, TRANSIÇÃO DEMOGRÁFICA E EPIDEMIOLÓGICA NA RDS DO TUPÉ, MANAUS, AMAZONAS. Hygeia - Revista Brasileira de Geografia Médica e da Saúde [Internet]. 2015 Jun 27; Available from: http://dx.doi.org/
18. Gordis L. Epidemiologia [Internet]. Thieme Revinter; 17 novembro 2017. 954 p.
19. Antunes JLF, Cardoso MRA. Uso da análise de séries temporais em estudos epidemiológicos. Epidemiol Serv Saúde [Internet]. 2015 [cited 2024 Jul 11];24(3):565–76. Available from: https://www.scielo.br/j/ress/a/zzG7bfRbP7xSmqgWX7FfGZL/abstract/?lang=pt
20. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, et al. Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. J Am Coll Cardiol [Internet]. 2020 Dec 22;76(25):2982–3021. Available from: http://dx.doi.org/10.1016/j.jacc.2020.11.010
21. Garritano CR, Luz PM, Pires MLE, Barbosa MTS, Batista KM. Analysis of the mortality trend due to cerebrovascular accident in Brazil in the XXI century. Arq Bras Cardiol [Internet]. 2012 Jun;98(6):519–27. Available from: http://dx.doi.org/10.1590/s0066-782x2012005000041
22. Gagliardi RJ, Gagliardi VDB. Características Clínico-Demográficas do Acidente Vascular Cerebral em Santa Maria, RS. Rev Neurocienc [Internet]. 2015 Sep 30 [cited 2024 Jul 11];23(3):326–7. Available from: https://periodicos.unifesp.br/index.php/neurociencias/article/view/7996
23. Brandão P de C, Lanzoni GM de M, Pinto IC de M. Rede de atenção às urgências e emergências: atendimento ao acidente vascular cerebral. Acta Paul Enferm [Internet]. 2023 Jan 20;36. Available from: https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1419851
24. Roni G, Araújo ACB, Maud H, Noll M, de Souza HM Jr, Campos MF, et al. Mortality from Stroke in Pará, Brazilian Amazon: a Joinpoint Analysis. jhgd [Internet]. 2024 Apr 11 [cited 2024 Jul 11];34(1):68–78. Available from: https://revistas.marilia.unesp.br/index.php/jhgd/article/view/15794
25. Gomes R, Nascimento EF do, Araújo FC de. Por que os homens buscam menos os serviços de saúde do que as mulheres? As explicações de homens com baixa escolaridade e homens com ensino superior. Cad Saúde Pública [Internet]. 2007 Mar [cited 2024 Jul 11];23(3):565–74. Available from: https://www.scielo.br/j/csp/a/rQC6QzHKh9RCH5C7zLWNMvJ/abstract/?lang=pt
26. Avezum Á, Costa-Filho FF, Pieri A, Martins SO, Marin-Neto JA. Stroke in Latin America: Burden of Disease and Opportunities for Prevention. Glob Heart [Internet]. 2015 Dec;10(4):323–31. Available from: http://dx.doi.org/10.1016/j.gheart.2014.01.006
27. Franceschi C, Garagnani P, Morsiani C, Conte M, Santoro A, Grignolio A, et al. The Continuum of Aging and Age-Related Diseases: Common Mechanisms but Different Rates. Front Med [Internet]. 2018 Mar 12;5:61. Available from: http://dx.doi.org/10.3389/fmed.2018.00061
28. Djaló ACN, de Souza OF, Maud H, Cavalcanti MPE, Figueiredo JL. Mortality from cerebral stroke in the State of Pernambuco, Brazil: an ecological study. Revista Brasileira de Crescimento e Desenvolvimento Humano [Internet]. 2024 Apr 11 [cited 2024 Jul 11];34(1):53–67. Available from: https://www.researchgate.net/publication/379786785_Mortality_from_cerebral_stroke_in_the_State_of_Pernambuco_Brazil_an_ecological_study
29. Kurtz P, Bastos LSL, Zampieri FG, de Freitas GR, Bozza FA, Soares M, et al. Trends in Intensive Care Admissions and Outcomes of Stroke Patients Over 10 Years in Brazil: Impact of the COVID-19 Pandemic. Chest [Internet]. 2023 Mar;163(3):543–53. Available from: http://dx.doi.org/10.1016/j.chest.2022.10.033
30. Logroscino G, Beghi E. Stroke epidemiology and COVID-19 pandemic. Curr Opin Neurol [Internet]. 2021 Feb 1;34(1):3–10. Available from: http://dx.doi.org/10.1097/WCO.0000000000000879
31. Sagris D, Papanikolaou A, Kvernland A, Korompoki E, Frontera JA, Troxel AB, et al. COVID-19 and ischemic stroke. Eur J Neurol [Internet]. 2021 Nov;28(11):3826–36. Available from: http://dx.doi.org/10.1111/ene.15008
32. Ministério da Saúde (BR) [Internet]. Manual de Procedimentos do Sistema de Informações sobre Mortalidade [cited 2024 Jul 11]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/sis_mortalidade.pdf.

Resumo

Introdução: o acidente vascular cerebral (AVC) é uma das principais causas de morte no Brasil e no mundo, porém a literatura carece de estudos que analisem a mortalidade por AVC no estado do Amazonas.

Objetivo: analisar a mortalidade por acidente vascular cerebral no estado do Amazonas, no período de 2000 a 2021.

Método: trata-se de um estudo ecológico de séries temporais com dados secundários de 2000 a 2021 obtidos do Departamento de Informação do Sistema Único de Saúde (DATASUS), para o estado do Amazonas.

Resultados: o ano de 2021 registrou o mais elevado número de óbitos por AVC ao longo da série histórica analisada, com um total de 851 óbitos. Este ano apresentou ainda o mais alto coeficiente de mortalidade entre 2015 e 2021, atingindo 31,84. O sexo masculino apresentou maior coeficiente de mortalidade em relação ao sexo feminino para a maioria dos anos. O coeficiente de mortalidade demonstrou ser maior para indivíduos com faixa etária acima dos 60 anos. A população de 80 anos ou mais apresentou tendência crescente para o coeficiente de mortalidade, com uma Variação Percentual Anual (VPA) de 2,34% (IC:95%; 0.18; 4.54). Para a população total e para os grupos etários de 20 a 29 anos e 30 a 39 anos o coeficiente de mortalidade permaneceu estável.

Conclusão: O coeficiente de mortalidade para a população total apresentou estabilidade. Para os indivíduos com mais de 80 anos houve uma tendência de crescimento.

Palavras-chave: acidente vascular cerebral, mortalidade, epidemiologia.