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RESEARCH ARTICLE (ORIGINAL)

Prevalence and risk factors associated with stroke in hypertensive patients: a hierarchical analysis

Prevalência e fatores de risco associados ao acidente vascular cerebral em pessoas com hipertensão arterial: uma análise hierarquizada

Prevalencia y factores de riesgo asociados con el accidente cerebrovascular en personas con hipertensión arterial: un análisis jerarquizado

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Abstract
Background: Stroke causes permanent sequelae and is the second leading cause of death worldwide. Poor blood pressure control corresponds to 80% of cases.
Objective: To analyze the prevalence and identify the risk factors for stroke in hypertensive patients using a hierarchical analysis.
Methodology: Cross-sectional study involving 378 hypertensive patients living in a municipality of Southern Piauí, Brazil, in 2018. Sociodemographic variables, health conditions, and lifestyles were analyzed using hierarchical multiple regression organized at distal, intermediate, and proximal levels, respectively.
Results: Stroke prevalence was 11.6%. Associated factors were: gender (AOR = 0.47; 95% CI: 0.23-0.95) and age (AOR = 1.03; 95% CI: 1.01-1.06) at the distal level; having a relative who has had a stroke (AOR = 2.01; 95% CI: 1.00-4.04) and going to the emergency room with altered blood pressure (*OR* = 2.01; 95% CI: 1.00-4.05) at the intermediate level; intake of high-fat foods (*OR* = 2.33; 95% CI: 1.15-4.72), intake of sweets (*OR* = 2.37; 95% CI: 1.15-4.90), and time as a smoker (*OR* = 1.02; 95% CI: 1.00-1.04) at the proximal level.
Conclusion: Prevalence was explained by a hierarchy of risk factors, thereby evidencing those classified as modifiable proximally.

Keywords: hypertension; stroke; primary health care; prevalence; risk factors

Resumo
Enquadramento: O acidente vascular cerebral (AVC) causa sequelas permanentes, sendo o descontrolo da hipertensão arterial responsável por 80% desses casos.
Objetivo: Analisar prevalência e determinar hierarquicamente fatores de risco associados ao AVC em pessoas com hipertensão arterial.
Metodologia: Estudo seccional com 378 pessoas com hipertensão arterial residentes no Sul do Piauí, Brasil, em 2018. Analisaram-se variáveis sociodemográficas, condições de saúde e estilo de vida por regressão múltipla hierárquica organizadas em níveis distal, intermédio e proximal.
Resultados: A prevalência foi de 11,6%. Os fatores associados: sexo (ORajustada = 0,47; IC95%: 0,23-0,95) e idade (ORajustada = 1,03; IC95%: 1,01-1,06) distalmente; familiar com AVC (ORajustada = 2,01; IC95%: 1,00-4,04) e ir à urgência com a pressão arterial alterada (*OR* = 2,01; IC95%: 1,00-4,05) em nível intermédio; ingerir alimentos com alto teor de gordura (*OR* = 2,33; IC95%: 1,15-4,72), ingerir doces (*OR* = 2,37; IC95%: 1,15-4,90) e tempo de fumador (*OR* = 1,02; IC95%:1,00-1,04) proximalmente.
Conclusão: A prevalência foi explicada por uma hierarquia entre os fatores de risco, evidenciando proximalmente aqueles classificados como modificáveis.

Palavras-chave: hipertensão; acidente vascular cerebral; atenção primária à saúde; prevalência; fatores de risco

Resumen
Marco contextual: El accidente cerebrovascular (ACV) causa secuelas permanentes y constituye la segunda causa de muerte en el mundo, respecto a la cual la falta de control de la hipertensión corresponde al 80% de los casos.
Objetivo: Analizar la prevalencia y determinar jerárquicamente los factores de riesgo asociados con el accidente cerebrovascular en personas con hipertensión arterial.
Metodología: Estudio seccional con 378 personas con hipertensión arterial residentes de un municipio del sur de Piauí (Brasil) en 2018. Se analizaron las variables sociodemográficas, las condiciones de salud y el estilo de vida a través de una regresión múltiple jerárquica organizadas en nivel distal, intermedio y proximal, respectivamente.
Resultados: La prevalencia del evento fue del 11,6%. Los factores asociados fueron: sexo (ORajustada = 0,47; IC95%: 0,23-0,95) y edad (ORajustada = 1,03; IC95%: 1,01-1,06) en el nivel distal; miembro de la familia con AVC (ORajustada = 2,01; IC95%: 1,00-4,04) y acudir a urgencias con la presión sanguínea alterada (*OR* = 2,01; IC95%): 1,00-4,05) en el nivel intermedio; ingerir alimentos con alto contenido de grasa (*OR* = 2,33; IC95%: 1,15-4,72), ingerir dulces (*OR* = 2,37; IC95%: 1,15-4,90) y tiempo de fumador (OR = 1,02; IC95%: 1,00-1,04) en el nivel proximal.
Conclusión: La prevalencia se explicó por una jerarquía entre los factores de riesgo, y se mostraron proximalmente aquellos clasificados como modificables.

Palabras clave: hipertensión; accidente cerebrovascular; atención primaria de salud; factores de riesgo

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Introduction

Stroke is the second leading cause of death worldwide, accounting for 6.24 million deaths in 2015 and is expected to remain in that position until 2030 (Organização Mundial da Saúde [OMS], 2015b). Its prevalence may vary according to the population and region under analysis. In regions of Asia, a systematic review showed a prevalence of 9.4% in South Asia, 6.1% in East Asia, and 9% in South-East Asia (Venketasubramanian, Yoonb, Pandianc, & Navarrod, 2017). In Latin America, a meta-analysis involving older people showed a prevalence of 7.6% in Cuba, 8.4% in the Dominican Republic, 6.8% in Peru, and 6.7% in Mexico (Ferri et al., 2011). In Brazil, a community-based epidemiological survey showed a prevalence of 1.5% in the general population (Bensenor et al., 2015). Regarding the burden of stroke per 100,000 Brazilian inhabitants in 2016, there was an incidence of 138.91, a prevalence of 1008.02, a mortality of 63.15, and 1437.74 disability-adjusted life years (DALYs; Santana et al., 2018).

Stroke is associated with several risk factors such as age, smoking, alcohol intake, dyslipidemias, sedentary lifestyle, and high blood pressure (HBP; Murakami et al., 2017). HBP is one of the main risk factors for stroke and is associated with poor outcomes (Forouzanfar et al., 2017). A review involving 154 countries showed that a systolic blood pressure (SBP) above 140 mm Hg was responsible for 2 million deaths due to hemorrhagic stroke and 1.5 million deaths due to ischemic stroke (Forouzanfar et al., 2017). Almost half of stroke-related deaths result from poor control of modifiable and, therefore, potentially preventable risk factors (Murakami et al., 2017).

A stroke results from a complex interaction between several types of factors. The literature has presented analytical strategies aimed at a better structured understanding of stroke risk factors (Kummer et al., 2019). Thus, few epidemiological studies have been using multilevel models that consider the hierarchical, intrinsic nature of the data, analyzing the positioning of the variables and their association with the event, while identifying theoretical-analytical structures that can be implemented in clinical practice for stroke prevention (Kummer et al., 2019).

In view of the above, this study sought to contribute to an understanding of the prevalence of stroke in a specific, high-risk population, based on a hierarchical analysis of distal, intermediate, or proximal risk factors for stroke. Thus, this study aims to analyze the prevalence and identify risk factors for stroke in hypertensive patients using a hierarchical analysis.

Background

The epidemiological scenario that associates HBP and stroke challenges the health systems, especially in developing countries, to develop care models that can address the risk factors for stroke, reducing the probability of occurrence of the event and, at the same time, providing a structure for monitoring survivors who require long-term treatments. Data from the National Health Survey (*Pesquisa Nacional em Saúde*, PNS) showed a high prevalence of stroke associated with risk factors such as advanced age, low schooling, and living in large cities (Bensenor et al., 2015).

The Chronic Condition Care Model (CCCM) proposed by OMS seeks to intervene in the health of the population by understanding the individual and collective risks and encouraging people to participate in their own care. This model is built on three columns: one column features the total population divided into subpopulations by risk strata; another column features the different levels of social determinants of health, distributed hierarchically into individual, intermediate, and proximal determinants; and the third column features the five levels of health interventions on determinants and their populations: promotional interventions (level 1), preventive interventions (level 2) and clinic management interventions on established chronic conditions (levels 3, 4 and 5; Mendes, 2018).

In Brazil, the CCCM is structured based on the Networks of Care for People with Chronic Diseases (*Redes de Atenção às Pessoas com Doenças Crónicas*, RASPDC). These networks organize care delivery to subpopulations and seek strategies to cope with noncommunicable diseases (NCDs), addressing mainly risk factors and health promotion behaviors (Chueiri, Harzheim, Gauche, & Vasconcelos, 2014). The first component of RASPDC is primary care (PC), and this is the space for monitoring and caring for people with HBP so as to identify groups vulnerable to secondary complications associated with poor BP control, such as stroke.

Research question

What is the prevalence of stroke, and how are risk factors organized hierarchically for its development in hypertensive patients treated in PC?

Methodology

This is an analytical cross-sectional study conducted in 17 basic health units (*Unidades Básicas de Saúde*, UBS) in the urban area of the municipality of Floriano, State of Piauí, Brazil. The simple random sample was calculated considering a population of 4,645 hypertensive patients registered in the Clinical Management System of Arterial Hypertension of PC (SIS-HIPERDIA), a stroke prevalence of 37.9%, a 95% confidence interval, and a 5% sampling error. After increasing the safety margin by 15%, 378 participants were contacted.

Inclusion criteria were: being 18 years of age or older; having a record of a medical diagnosis of HBP on the patient file at the UBS; and being registered in the SIS-HIPERDIA. Exclusion criteria were: patients experiencing decompensation at the time of data collection; pregnant women; people hospitalized for treatment or at an address other than that registered with the UBS.

The participants were selected from the records of each

UBS. The records were arranged in ascending order and randomly selected proportionally to the number of records of each unit until sample size was reached. If the selected participant was not found for data collection, another individual would be randomly selected from the records, reducing the sample losses.

The selected participants were contacted at the UBS during their routine consultation. Data were collected in their homes after prior scheduling and follow-up by the community health agent. In the case of individuals with stroke-related communication difficulties, the interview was conducted with a family caregiver who could provide more accurate information.

Data were collected through a questionnaire divided into three groups of variables: 1) sociodemographic profile (age, gender, self-reported race/skin color, schooling, individual income in minimum wages - R$ 954,00 Reais, in force in that period); 2) health conditions (history of a first-degree relative who has had a stroke, having a prescription for HBP medication, having been denied care at the health center, number of times that he/she went to the health center in the past year, and if he/she went to the emergency room in the past year due to altered BP); 3) lifestyle (if he/she smokes, if he/she was a smoker, for how long he/she smoked, alcohol consumption, intake of high-fat foods, red meat, white meat, fish, and sweets at least once a week). The stroke outcome was self-reported and confirmed in the tests requested at the time of the home visit. The questionnaire was based on the Brazilian Guidelines for HBP (Malachias et al., 2016).

The analyses were carried out using IBM SPSS software, version 22.0, including descriptive statistics and association tests (Pearson's chi-square and *S*tudent's *t*-test). Finally, multiple logistic regression was performed with a hierarchical technique. The variables with a *p*-value ≤0.20 in the bivariate analysis were submitted to regression analysis. To estimate the strength of the association, odds ratio (OR) was calculated with a 95% confidence interval. A level of statistical significance of 5% was considered.

In the regression analysis, the dependent variable was the occurrence of stroke. To build the model hierarchy, the CCCM framework was used, which proposes a comprehensive and hierarchical structure in the second column (Mendes, 2018). So, in this model, the hierarchy of the variables used the following data entry sequence: 1) variables at the distal hierarchical level, with less capacity for determining stroke (sociodemographic profile); 2) variables at the intermediate hierarchical level (health conditions of hypertensive patients); 3) variables at the proximal hierarchical level (lifestyle of hypertensive patients). In this stage of analysis, the criterion established for the variables to remain in the final theoretical model was statistical significance with a *p*-value <0.05.

The study was approved by the Ethics and Research Committee of the Federal University of Piauí, respecting the legislation on research with human beings (approval no. 2.350.946). Participants were informed about the risks and benefits of research, and all signed the Informed Consent Form before data collection.

Results

This study showed a prevalence of stroke of 11.6% among the hypertensive patients who participated in the study, being hierarchically associated with the sociodemographic variables, health conditions, and lifestyle.

The sociodemographic characteristics showed that 68.5% were women, 71.4% were older people, 22.5% reported having a black skin color, 24.9% reported that they were unable to read or write, and 53.7% earned up to a minimum wage. In addition, the prevalence of stroke in men was twice as high as that in women (Table 1).

Table 1
Association between stroke and the sociodemographic characteristics of hypertensive patients registered in the UBS (n = 378)

Sociodemographic variables	*n*(%)	Stroke		*p*-value	*OR* (95% CI)
		YES *n*(%)	NO *n*(%)		
Stroke prevalence	378(100%)	44(11.6%)	334(88.4%)		
Gender					
Male	119 (31.5)	21 (17.6)	98 (82.4)	0.014	0.45
Female	259 (68.5)	23 (8.9)	236 (91.1)		(0.24;0.86)
Age					
< 60 years	108(28.6)	8(7.4)	100(92.6)	0.102	1.93
≥ 60 years	270(71.4)	36(13.4)	233(86.6)		(0.86;4.30)
Skin color					
Black	85 (22.5)	36 (12.3)	257 (87.7)	0.467	0.74
Other	293 (77.5)	8 (9.4)	77 (90.60		(0.33;1.66)
Years of formal education					
Unable to read/write	94 (24.9)	12 (12.8)	82 (87.2)	0.446	-
<9 years	174(6.6)	23(13.1)	153(86.9)		
>9 years	108 (28.6)	9 (8.3)	99 (91.7)		
Income					
>one minimum wage	175 (46.3)	21 (10.3)	182 (89.7)	0.398	1.31
<one minimum wage	203 (53.7)	23 (13.1)	152 (86.9)		(0.69;2.46)

Note. OR = Odds ratio; CI = Confidence interval.

Regarding the health conditions of hypertensive patients, one third (34.7%) reported having a relative who had a stroke, almost all of them (97.1%) had a prescription for HBP medication, 18% sought the UBS and received no care, and 29.1% went to the emergency room with altered BP. The occurrence of stroke was associated with going to the emergency room with altered BP (Table 2).

Table 2
Association between stroke and the health conditions of hypertensive patients registered in the UBS (n = 378)

Variable Health conditions	*n*(%)	Stroke		*p*-value	*OR* (95% CI)
		YES *n*(%)	NO *n*(%)		
Relative who has had a stroke					
No	247 (65.3)	23 (9.3)	224 (90.7)	0.053	1.85
Yes	131 (34.7)	21 (16.0)	110 (84.0)		(0.98; 3.50)
Medication prescription					
Yes	367 (97.1)	41 (11.2)	326 (88.8)	0.101	2.98
No	11 (2.9)	3 (27.3)	8 (72.7)		(0.76;11.68)
Receiving no care at the UBS					
Yes	310 (82.0)	39(12.6)	271 (87.40	0.223	0.55
No	68 (18.0)	5 (7.40)	63 (92.6)		(0.20;1.45)
No. of visits to the UBS					
None	109 (28.8)	1.95*	2.17*	0.246***	
< 2 times	144 (38.1)	(2.38)**	(2.30)**		-
> 2 times	125 (33.1)				
Emergency room with altered BP					
No	268 (70.9)	25 (9.3)	243 (90.7)	0.029	2.02
Yes	110 (29.1)	19 (17.3)	91 (82.7)		(1.06;3.86)

Note. OR = Odds ratio; CI = Confidence interval; *Mean; **Standard deviation; ***Student's *t*-test

Regarding the variables related to the lifestyle of hypertensive patients, most of them did not smoke or drink alcohol. However, 57.1% had been smokers. A total of 35.2% and 46.6% of the participants reported eating high-fat foods and sweets, respectively. Of these, having been a smoker, time as a smoker, intake of high-fat foods, and intake of sweets at least once a week were associated with stroke (Table 3).

Table 3
Association between stroke and the lifestyle of hypertensive patients registered in the UBS (n = 378)

Variable Lifestyles	*n*(%)	Stroke		*p*-value	*OR* (95% CI)
		YES *n*(%)	NO *n*(%)		
Current smoker					
No	336 (88.9)	39 (11.6)	297 (88.4)	0.955	1.02
Yes	42 (11.1)	5 (11.9)	37 (88.10		(0.38;2.77)
Former smoker					
No	162 (42.9)	16 (7.4)	200 (92.6)	0.003	2.61
Yes	216 (57.1)	28 (17.3)	134 (82.7)		(1.36;5.01)
Time as a smoker					
< 10 years	273 (72.2)	15.64*	8.10*	0.001***	-
> 10 years	105 (27.8)	(16.81)**	(13.18)**		
Current drinker					
No	292 (77.0)	36 (12.4)	255 (87.6)	0.418	0.71
Yes	87 (23.0)	8 (9.2)	79 (90.8)		(0.31;1.60)
Intake of high-fat foods					
No	245 (64.8)	21 (8.6)	224 (91.4)	0.012	2.23
Yes	133 (35.2)	23 (17.3)	110 (82.7)		(1.18;4.20)
Intake of red meat					
No	20 (5.3)	1 (5.0)	19 (95.0)	0.341	2.59
Yes	358 (94.7)	43 (12.0)	315 (88.0)		(0.33;19.86)
Intake of white meat					
Yes	370 (97.9)	42(11.40)	328 (88.6)	0.234	2.60
No	8 (2.1)	2 (25.0)	6 (75.0)		(0.50;13.31)
Intake of fish					
Yes	290 (76.7)	36 (12.4)	254 (87.6)	0.395	0.70
No	88 (23.3)	8 (9.1)	80 (90.9)		(0.31;-1.58)
Intake of sweets once a week					
No	202 (53.4)	14 (6.9)	188 (93.1)	0.002	2.75
Yes	176 (46.6)	30 (17.0)	146 (83.0)		(1.41;5.39)

Note. OR = Odds ratio; CI = Confidence Interval; *Mean; **Standard deviation; *** Student's *t*-test

In the hierarchical regression analysis, the following variables remained in the final model: gender and age, relating to the sociodemographic characteristics; having a relative who has had a stroke and having gone to the emergency room with altered BP, relating to the health conditions of hypertensive patients; and intake of high-fat foods, intake of sweets, and time as a smoker, relating to the lifestyle of the population under study. The model was adjusted by the variable having a prescription for HBP medication (Table 4).

The model revealed variables that increased the probability of stroke: intake of high-fat foods increases it by 2.33 times; intake of sweets increases it by 2.37 times; each year as a smoker increases it by 1 time; having a relative who has had a stroke increases it by 2 times; having gone to the emergency room with altered BP increases it by 2 times; each year of life increases it by 1 time; and males had a 53.0% higher probability of suffering a stroke than women (Table 4).

Table 4
Final model of hierarchical logistic regression of the variables that predict stroke in hypertensive patients registered in the UBS (n = 378)

Groups of variables	*p-value*	AOR (95% CI)
Group 1- Sociodemographic variables		
Gender	0.037	0.47 (0.23;0.95)
Age	0.009	1.03 (1.01;1.06)
Group 2- Variable of health conditions		
Having a relative who has had a stroke	0.049	2.01 (1.00;4.04)
Having a prescription for HBP medication	0.451	1.78 (0.39;7.98)
Having gone to the emergency room with altered BP	0.049	2.01 (1.00;4.05)
Group 3- Variables of lifestyle		
Intake of high-fat foods	0.019	2.33 (1.15;4.72)
Intake of sweets at least once a week	0.019	2.37 (1.15;4.90)
Time as a smoker (in full years)	0.034	1.02 (1.00;1.04)
Constant	0.000	0.003

Note. AOR = Adjusted Odds Ratio; CI = Confidence Interval. 0.103 (R^2 Cox & Snell); 0.201 (R^2 Nagelkerke).

Discussion

Thinking about care delivery to hypertensive patients and the occurrence of comorbidities such as stroke should go beyond individual accountability through treatment self-management. Seeking to understand stroke through the expansion of the research focus, considering other determinants related to the individual and the health system that can influence its occurrence, is a necessary exercise to understand the complexity of the occurrence of chronic diseases in the population.

Research on stroke as a complication in hypertensive patients in PC allowed drawing an explanatory line for this morbidity event, considering a socio-individual capacity that is hierarchically composed of sociodemographic factors, health conditions, and lifestyle associated with the CCCM.

This study found a significant prevalence of stroke - 11.6% - in the sample, lower than that found in a study conducted with hypertensive patients in a northeastern Brazilian capital (Lima, Moreira, Borges, & Rodrigues, 2016). This difference can be explained by the fact that this study investigated the occurrence of stroke in patients who had already some type of complication due to HBP (Lima et al., 2016). Stroke is also considered a potentially serious complication with often fatal outcomes that may have been reflected in the prevalence found.

In the hierarchical model, the occurrence of stroke distally was more prevalent among males and older people. This result corroborates a study that found a higher prevalence of stroke in men in Brazil (Bensenor et al., 2015). The data collection technique can influence these results. Women report more symptoms than men, which may explain the higher prevalence found using the questionnaire than the diagnosis made by a single question, which found no statistical differences between men and women (Bensenor et al., 2015). In this study, in addition to the questioning, tests were consulted to confirm the event.

In Japan, a study examined differences in traditional risk factors for stroke among the old-old compared with the young-old and concluded that the occurrence of this complication was significantly higher among older people, indicating prevention strategies according to this age category (Murakami et al., 2017). Thus, PC professionals need to direct monitoring and care efforts to older people with HBP. Thus, health surveillance activities can be planned for the monitoring of the distal variables, culminating in the planning of interventions to reduce the risk of stroke in this population.

The explanatory model showed that the variables having a relative who has had a stroke and having gone to the emergency room with altered BP were significant at the intermediate level. In India, a study found an association between the parent-child dyad with a risk of 1.58 times more of developing this disease, suggesting a strong association between chronic conditions in adults and heredity (Patel et al., 2017). This shows that the RASPDC needs to structure the longitudinal follow-up not only of hypertensive patients but also of those with relatives with risk factors for this event.

The visit to the emergency room with altered BP increases the probability of stroke by two times. A population-based study conducted in Rotterdam, in the Netherlands, showed that rapidly increasing BP patterns were associated with high risk of stroke and death, while moderately high BP was associated only with increased risk of stroke (Portegies et al., 2016). To keep BP levels within the normal range and avoid a hypertensive crisis that can trigger stroke, it is necessary to implement a culture of health education that makes people aware of the importance of adhering to HBP treatment in order to avoid dangerous BP levels. PC should promote the follow-up of hypertensive patients in order to monitor the families of these individuals. The work of community health agents can be of great value,

given that they are inserted in the community and know individuals and their family composition. Education programs to promote healthy lifestyles and BP control should direct their efforts to families with hypertensive patients at risk for stroke.

At the proximal level were variables related to the individuals' behavior, showing that the adoption of an unhealthy lifestyle increases the probability of stroke among hypertensive patients. The intake of high-fat foods and sweets and having been a smoker for some time in life showed a strong association with stroke. PC should develop health promotion efforts that include the promotion of healthy eating habits and tobacco non-use. As this is modulation of behaviors, which are very difficult to be remodeled or redirected when already established, the interventions must be implemented early in people's lives. Thus, the existence of a school health program is important to implement health actions among the young population to prevent HBP and even stroke in adulthood.

Regarding tobacco use, the years of exposure to cigarettes remained a risk factor for stroke, considering that its effects seem cumulative and directly associated with the years of exposure to tobacco smoke, according to the National Cancer Institute José Alencar Gomes de Silva (INCA, 2014). A meta-analysis of studies in Europe and North America found an increased risk of 1.5 times for stroke among smokers, and that the risk ratio tends to increase with the linear daily consumption of 10 cigarettes and to decrease over time since smoking cessation in a dose-response manner (Mons et al., 2015).

It should be noted that in recent decades there has been a reduction in tobacco use due to tobacco control policies, increased taxes, ban on tobacco advertising, and wide dissemination of its harms, including the use of discouraging images in tobacco packaging (INCA, 2014). According to OMS, cross-sectoral policies need alignment to improve positive health outcomes, such as the anti-smoking policy that acts on several fronts, including the industry (OMS, 2015a).

Regarding the dietary pattern, the intake of high-fat foods and sweets increased the odds ratio for stroke development. These findings corroborate those found in a study on the global burden of disease related to disability-adjusted life years in Brazil, where an inadequate diet ranked first in the list of risk factors, especially among women (Malta et al., 2017). A study conducted in Denmark on the effects of a protective diet (Nordic diet) with low sugar and fat and rich in vegetables found a reduction in the incidence of ischemic stroke when compared to the control group that was not on this diet (Hansen et al., 2017).

However, it is known that the acquisition of healthy eating habits is associated with several factors, such as culture, income, education, access to food, among others, which can hinder adherence. A study conducted with hypertensive older people in Rio Grande do Sul found that eating habits were not those desired in relation to the recommended standards and were associated with low schooling, being retired, low family income, and little physical activity (Gandenz & Benvegnú, 2013), which are similar characteristics to those found in this study.

In general, the prevalence of stroke can be explained by risk factors organized in a hierarchical model, and the factors related to lifestyle were those more associated with stroke. Therefore, investing in the design of interventions that can encourage a change of habits, namely BP control, may reduce the risk of stroke in hypertensive patients. The treatment of these conditions should be reoriented around the patient and the family, extending beyond the limits of the clinic and penetrating the home and work environments in order to minimize the onset of these conditions and their effects through early detection, increased physical activity, reduction of smoking, and reduction of excessive consumption of unhealthy foods.

A limitation of this study was the possibility of prevarication bias when the patient was asked about life habits, so the researchers tried to clarify the importance of providing true information in the questionnaire while explaining that the participants would not be identified in the research.

Conclusion

Considering the severity of the occurrence of stroke, a high prevalence of this complication was found in hypertensive patients. The proposed model showed a hierarchy of risk factors in the occurrence of this event: lifestyle factors such as intake of high-fat foods, intake of sweets, and smoking time at a proximal level; health conditions such as having a relative who has had a stroke, and going to the emergency room with altered BP at an intermediate level; gender and age at a distal level.

It is important to plan PC interventions that take into account the hierarchy of these factors. These activities range from interventions for health surveillance of distal risk factors, monitoring of families through PC equipment, to the design and implementation of educational programs to promote healthy lifestyles with multiple, ongoing strategies. Planning and implementing these interventions will lead to better control of these risk factors and may reduce the occurrence of stroke in hypertensive patients. The modifiable factors stand out as contributing factors to the occurrence of this complication and should be targeted in intervention strategies to be designed in future studies.

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