Risk Factors and Sociodemographic Characteristics of Ischemic Stroke in Brazil – A Systematic Review

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Abstract— *Introduction: Ischemic stroke corresponds to 80% of cases in Brazil, which demonstrates its epidemiological importance in Brazil. The magnitude of this fact reflects the reason why stroke is considered the second leading cause of death in the world, and the leading cause of death in Brazil, in addition to being the second leading cause of cognitive losses. The main causes that promote the occurrence of ischemic stroke determine the conjuncture of risk groups. Such factors can be classified into modifiable, non-modifiable and potential risk group. Objective: The objective of this study was to systematically review the public health literature on the risk factors and sociodemographic characteristics of ischemic stroke in Brazil, by analyzing epidemiological studies conducted in Brazil. Methods: Systematized literature review conducted by searching the US National Library of Medicine (Pub Med), Scientific Electronic Library online (SCIELO), Latin American Caribbean Health Sciences Information System (LILACS), Science Direct and Embase, using the descriptors: "Isquemic stroke", "risk factors", "sociodemographic characteristics" and "Brazil". 852 articles were found, of which 11 were selected to build the review by six reviewers independently. Results: Chronic noncommunicable diseases (CNCD), such as stroke and ischemic heart disease, account for 63% or about 36 million of deaths worldwide, with emphasis on diseases of the circulatory system, diabetes, cancer and respiratory disease chronic. In Brazil, NCDs also present themselves as a health problem, corresponding to 54.0% of all deaths, in the year 2016. In the age group of 30-69 years, NCDs represented 56.1% of deaths. Conclusion: It is known today that stroke is one of the major causes of morbidity and mortality among patients, being the majority in the elderly. It is associated with CNCDs, among which we mention hypertension, diabetes and dyslipidemia. Such a disease is more common in men, blacks and those with low schooling, but in women it is more lethal, according to pre-existing data. Thus, new methodologies and analyzes need to be developed on the effects of the multiplicity of chronic diseases, which affect the elderly more intensely.*

Keywords— *Isquemic stroke, risk factors, sociodemographic characteristics and Brazil.*

I. INTRODUCTION

Ischemic stroke is a disease resulting from an obstruction of a cerebral artery, usually resulting from fat deposits due to atherosclerosis and/or blood clotting. The decrease in neurological function occurs by blocking the circulation in a certain brain area, causing ischemia, also known as stroke. These events promote the death of nervous tissue due to lack of blood supply to the obstructed area[1].

Ischemic stroke is classified into three types: embolic, thrombotic and lacunar. The first is derived from small portions of matter that are released into the bloodstream and move to the cerebral arteries. The second is due to the development of a clot or thrombus inside the cerebral arteries or their branches. And finally, the third is caused by small infarcts that occur only where perforating arterioles branch directly from the great vessels. The neurological abnormalities of the stroke determine that the brain injury is opposite to the signs of motor deficit [2].

In Brazil, 80% of cases of stroke are classified as ischemic stroke, demonstrating its epidemiological importance in the country, resulting in the first cause of death in Brazil, besides being the second cause of cognitive loss [1,3].

Studies show that the individuals most affected are elderly, generally males from the black ethnic group. However, the most severe cases affect female patients, referring to a higher lethality rate than males. Other studies also show that stroke incidence and hospitalization rates emerge among young people, becoming a public health issue [4,5].

The main associated risk factors that increase the occurrence of ischemic stroke can be classified as modifiable, non-modifiable and potential risk group. In the first classification, the greatest relationship arises from habits such as smoking and the control of pre-existing diseases such as hypertension and diabetes mellitus. The second classification, non-modifiable risk factors, presents characteristics such as advanced age, gender and ethnicity. The potential risk group lists factors resulting from bad life habits, such as sedentariness, obesity and alcoholism. Obesity is believed to be a triggering factor for cardiovascular diseases, transfiguring it as one of the key points for risk classification models [6].

The stroke, usually resulting from the factors listed above, in addition to mortality, can generate after-effects that not only impact the individual, but also the social and economic sphere. These after-affects can compromise the individual's productivity and autonomy, and can be described and observed by the main signs and symptoms such as paresis, pain, visual deficits and motor attenuation [7].

The extent and establishment of collateral flow is determined by the affected site, severity, signs and symptoms. The main indicative signs can be listed as loss of strength, sudden headache, loss of speech, imbalance, visual changes, immediate sensitivity changes, instability, dizziness, nausea or vomiting, fatigue, and personality and mood changes [8].

As for the diagnosis, the ischemic stroke is detected by means of imaging tests that make it possible to identify the affected area of the brain, and some tests can be cited for their high degree of accuracy to confirm the mechanisms of the stroke. This set includes the following exams: computed tomography (CT), magnetic resonance imaging (MRI), electrocardiogram, echocardiogram and carotid Doppler ultrasound [9].

The objective of the present study was to systematically review the public health literature on risk factors and sociodemographic characteristics of ischemic stroke in Brazil, through analysis of epidemiological studies conducted in Brazil.

II. METHODS

This study is a systematic review, classified as exploratory and descriptive. The research was carried out in electronic databases on methods associated with RSL (Systematic Literature Review) and SMARTER (*Simple Multi-Attribute Rating Technique using Exploiting Rankings*) applications. The work performed is quali-quantitative. The qualitative analysis of the data is carried out intuitively and inductively during the survey of the theoretical reference. It is also quantitative by using the multicriteria method. In addition, there is also a numerical experimental study in order to simulate a selection situation of articles based on the criteria observed. From the bibliographic search, located in the databases: *US Nacional Library of Medicine* (Pub Med), *Scientific Electronic Library on-line (*SCIELO), Latin American System of Health Sciences Information (LILACS), *Science Direct (*Elsevier) and Embase.

The search in the databases was performed using the terminologies registered in the Health Sciences Descriptors created by the Virtual Health Library developed from the *Medical Subject Headings of* the *U.S. National Library of Medicine*, which allows the use of common terminology in Portuguese, English and Spanish. The keywords used in the Portuguese language for searching the databases were: Ischemic stroke, risk factors, sociodemographic characteristics and Brazil. As a tool to support decision making in the selection and prioritization of articles, a set of criteria were considered essential to represent the state of the art of the subject object of the research. This method has the following characteristics: (i) rigorous logic allows the acceptance of the method as a decision support tool; (ii) simple to be understood and applied with results that are easy to interpret. After all, the result obtained totaled 11 (eleven) articles that contemplated the desired characteristics for the study.

III. THEORETICAL REFERENCE

According to the Brazilian Society of Cerebrovascular Diseases, the Cerebral Vascular Accident (CVA) presents great morbidity and mortality, being the main cause of death for Brazilians. All over the world, it is a disabling disease because, due to its after-affects, approximately 70% of people do not return to work and 50% become dependent on other people on the day they leave. Although it affects individuals over 60 more frequently, stroke can occur at any age, including children. *Stroke* has been increasing among young people, occurring in 10% of patients under 55 years and the *World Stroke Organization* predicts that one in six people in the world will have a stroke during their lifetime [10].

According to the World Health Organization (WHO), stroke refers to the rapid development of clinical signs of focal and/or global disorders of brain function, with symptoms lasting 24 hours or more, of vascular origin, causing changes in the cognitive and sensory-motor planes, according to the area and extent of the injury. The most common sign of a stroke, which occurs more frequently in the adult phase, is sudden weakness or numbness of the face, arm and/or leg, usually on one side of the body. Other frequent signs include: mental confusion, cognitive change, difficulty speaking or understanding, swallowing, seeing with one or both eyes and walking; hearing disorders; dizziness, loss of balance and/or coordination; severe headache with no known cause; decreased or loss of consciousness. A very serious injury can cause sudden death [11].

The classifications of strokes are: anoxic-ischemic (result of vasogenic failure to adequately supply the brain tissue with oxygen and substrates) and hemorrhagic (result of blood spillage into or around the structures of the central nervous system). Ischemic subtypes are lacunar, atherosclerotic and embolic, and hemorrhagic are intraparenchymal and subarachnoid[12]. Since the focus of this study is the ischemic stroke, the theoretical basis follows only this classification.

Ischemic stroke is a persistent focal neurological deficit, the result of ischemia followed by infarction. This event is caused by proximal obstruction of an artery by a thrombus, plunger or tumor compression. The clinical picture appears quickly due to the absence of glucose contribution to the neurons. After a few minutes of ischemia, an infarction occurs (death of the affected brain tissue). If the ischemia is reversed before the death of the neurons, the event is called transient ischemic attack [13].

The stroke begins with a series of widespread events that occur with brain ischemia, defined as a cascade of brain ischemia. The exact timing of each event depends on many variables, such as the size of the infarction, the onset and duration of the ischemia, and reperfusion efficiency [14].

Acute occlusion of an intracranial vessel reduces blood flow to the brain region it supplies. The degree of reduced flow is a function of collateral blood flow, and this depends on the vascular anatomy (which can be altered by the disease), the site of occlusion, and the systemic blood pressure. A decrease in cerebral blood flow to zero causes brain tissue death in 4 to 10 minutes; values < 16 to 18 mL/100 g of tissue per minute cause infarction within 1 hour; and values < 20 mL/100 g of tissue per minute cause ischemia without infarction, except when prolonged for several hours or days [15].

Ischemic events start with sudden or gradual brain hypoperfusion and include bioenergetic cell failure, excitotoxicity, oxidative stress, blood-brain barrier dysfunction, microvascular injury, homeostatic activation, inflammation and eventual neuronal, glial, and endothelial cell necrosis. The hematoencephalic barrier (BHE) disruption in stroke seems to depend on the aggressiveness and reperfusion response. Within the first 24 hours after a stroke, there is an increase in BHE permeability, and the greatest damage occurs between 48-72 hours after the event [14].

The main risk factors for strokes are divided into three groups, being the modifiable (hypertension, smoking, diabetes mellitus), non-modifiable (age, gender, race) and the potential risk group that includes sedentariness, obesity, and alcoholism [16].

Most of the care of stroke patients in Brazil is performed in secondary hospitals, which often do not have adequate infrastructure for full care of this type of patient (17). As part of addressing this problem, the Ministry of Health, since April 2012, has had criteria for qualification of hospital facilities wishing to implement the Stroke Emergency Care Center (CAUAVC), under the Unified Health System (SUS), through Ordinance No. 665/2012. As a way of organizing a specialized service, with a role of reference to treat this disease and articulated between federal, state, and municipal governments, these Centers, also called Stroke Units, are classified into three types (type I, II, and III), which will depend on the size and capacity of the Hospital in which it is inserted [18].

The Basic Health Care Network plays an important role in health promotion and disease prevention. For this, some measures are very relevant and need to be considered, such as permanent health education, people management action, formation of multiprofessional teams

through the Family Health Support Centers (NASF), training community health agents and other members of Family Health Strategies (ESF), referral to trained professionals, promotion of educational campaigns with accessible language allowing the population itself to identify groups at risk and seek assistance when necessary, and stimulation of health education for groups at risk[16].

Prevention is the primary strategy to reduce stroke-related morbidity and mortality, adequate treatment, control of risk factors, and lifestyle changes can prevent up to 50% of stroke cases. However, there are no specific recommendations or guidelines for preventing stroke in young adults. In general, prevention strategies are similar for young and elderly patients[19].

Epidemiological research makes it possible to sensitize, raise awareness and alert health managers and health professionals to develop appropriate strategies for preventing disease, and enable health professionals, especially those in primary care, to create actions to motivate and mobilize the population at risk to promote permanent changes in living habits, and thus reduce the mortality rate from stroke [20].

In 2002, the Registration and Follow-up System for Hypertensive and Diabetic Patients (Registration and Monitoring System for Hypertensive and Diabetics), called Hiperdia, was implemented in Brazil, which consists of the continuous follow-up of such patients, together with the basic health units of the Unified Health System (SUS), with the supply of medications and the promotion of healthy living habits. Although it has existed for almost two decades, there are still no studies that estimate the effect of the implementation of Hypertenia at the national level on the most common complication of cerebrovascular events, which is hospitalization for stroke. The estimation of this event is the main outcome indicator that directly evaluates the effects of preventive care for this morbidity. On the other hand, the proportion of hospital deaths from strokes after medical care represents an indicator of the quality of care in pre- and intrahospital emergency/emergency services [21].

One of the measures usually used to compare the quality of care is hospital mortality from strokes up to 30 days, which represents its effectiveness. Care in the acute phase must be timely and effective to prevent brain tissue death. In order for the stroke care to be resolutive, it is necessary to have a minimum set of technologies available at the correct time, such as the performance of computerized tomography ideally within four and a half hours after the onset of symptoms, in addition to other supports provided, in general, by specialized units. The use

of imaging exams for the care of the stroke is relevant for the differential diagnosis, definition and therapeutic prescription of appropriate care. As an indicator of quality of care, hospital mortality is a preliminary screening tool to discriminate hospitals potentially at risk of providing services of inadequate quality or below the expected standard. In this assessment, an adequate risk adjustment for clinical and demographic factors of the patient is essential, since the severity profile of the case interferes with care outcomes [22].

IV.   RESULTS

Eight hundred and fifty-two articles were identified in the stroke databases. From this the method *Simple Multi-Attribute Rating Technique using Exploiting Rankings* (SMARTER) was chosen. Of the 852 articles found by the combination of descriptors, 42 were selected for full text reading and only 11 articles were included for descriptive data analysis. In Figure 1, we describe the strategy for selecting articles on the subject in question.
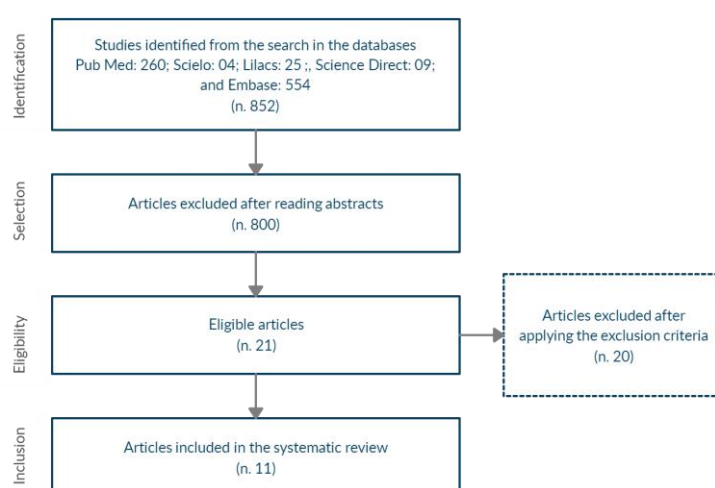

Fig.1: A search strategy for articles on interventions for caregivers of stroke survivors

Between the years 2010 and 2016, stroke mortality rates in women aged 30 to 69 decreased by 11%. This data was verified by the study Saúde Brasil 2018, conducted by the Ministry of Health. In this same period, the stroke rate decreased from 39.5 to 35.2 deaths per 100,000 female inhabitants, while Cardiac Diseases decreased from 55 to 51.6 deaths per 100,000 [23].

For the calculation of these figures, the study Saúde Brasil used the populations published by the Brazilian Institute of Geography and Statistics (IBGE); and for the standardized rate, the 2010 Brazilian Census.

The Strategic Action Plan for Chronic Noncommunicable Diseases (NCD) has shown a reduction in deaths from the two most deadly Chronic Noncommunicable Diseases (NCDs) in the country, which are stroke and ischemic heart disease. This action has been developed by the Ministry of Health with states and municipalities in the population [24].

Table 1. Description of the main study findings in the selected articles on stroke.

Author/year (reference)	Population	Tools	Results
Assis et al., 2013	120 patients	Analysis of medical records (database)	Epileptic state, metabolic disorders and duration of disease were associated with hospital death. Epilepticus status was an independent risk factor for mortality.
Lamb; Martins, 201	385784 patients	Analysis of medical records (database)	higher mortality comorbidities; lower mortality with adequate hospital support
Eisen et al. 201	15833 patients	Analysis of exams And records (database)	patients with atherosclerosis, increased risk of stroke and myocardial infarction
Kuster et al., 2015	206 patients	Application of scales	the use of scales improves treatment and decreases the risk of mortality, especially the analysis of associated vascular damage
Lange et al., 2018	359 patients	Examination analysis	positive correlation of atherosclerosis and stroke
Leitão et al., 2018	150 patients	Quiz	failure to know the risk of stroke in patients with atrial fibrillation; neglect
Pedroso et al., 2017	60 patients	Analysis of and (database)	exams positive correlation between stroke and records patients with psychiatric disorders
Perera et al., 2016	2144 patients	Analysis of medical records (database)	higher risk of stroke in patients with atrial fibrillation (women over 75 years)
Rocha et al., 2014	120 patients	Analysis of medical records (database)	epileptic seizures increase the risk of stroke, neoplasms and dementia

The Plan has the propagation of Basic Care as one of the main actions to confront NCD's, since in primary care one is able to solve up to 80% of health problems. The set of actions presents a result in increased access to health services, early diagnosis and treatment, as well as health promotion actions. Although there has been a fall, the two diseases remain at the top of those that kill the most women between 30 and 69 years of age [24].

Chronic non-communicable diseases (NCD), such as stroke and ischemic heart disease, account for 63% or about 36 million of the world's deaths, especially circulatory diseases, diabetes, cancer and chronic respiratory disease. In Brazil, NCD also presents itself as a health problem, corresponding to 54.0% of all deaths in the year 2016. In the 30-69 age group, NCD represented 56.1% of deaths.

Lifestyle and living conditions influence the occurrence of chronic non-communicable diseases. The World Health Organization (WHO) includes as important NCD the chronic respiratory diseases, circulatory system diseases (cerebrovascular, cardiovascular), diabetes mellitus and neoplasms. This disease has in common a number of risk factors, which may lead to a common approach to its prevention.

V.   DISCUSSION

According to Hobbs [25], the worldwide incidence of AF (atrial fibrillation) is 1% to 2% of the total population.

Of the patients undergoing anticoagulant therapy, only 25.9% identified stroke as a risk of not adherence to treatment with AF anticoagulant. This alarming number shows us why AF patients continue to be seen frequently in stroke units, even in the face of a well known primary risk[26,27]. The crucial role of anticoagulation and adherence to AF therapy should be as evident to patients as to physicians.

The level of information should be as clear as possible. Considering the risks of anticoagulant therapy, education of patients about the disease and its risks is essential to improve compliance and reduce complications[28,29]. There is an alarming lack of knowledge about the basic concepts of AF and stroke. Studies have shown that 62.0% of patients with previous history of strokes had no knowledge about strokes as an AF complication. The lack of knowledge cannot be fully explained by the negligence of medical assistants. However, most of them did not mention the risk of strokes, so we can assume that there was a problem in communication.

Inadequate language and lack of effort in teaching patients may be interrelated. A low socioeconomic and educational level may also have contributed to low patient understanding.

Compared to other diseases, the stroke presented the highest gross hospital mortality rate (HBM) and highest *odds ratio* (OR), consistent with the severity of the diseases described in Brazilian studies. Regarding the comorbidities indexes, the highest chance of death when the congestive heart failure score (CHF score) was equal to or higher than two indicated greater severities, similar to previous studies[30,31].

Of the Elixhauser comorbidities, the presence of low weight (OR = 1.82) stands out, as the other comorbidities had a protective effect. However, the quality of the information affects the accuracy of this type of index. In addition, pneumonia (OR = 1.49) presented a higher risk of death, but it is not possible to determine whether it was present at admission or whether it occurred during hospitalization, i.e., it was not possible to say whether it was a comorbidity or an avoidable complication. Moreover, as expected, they present a higher risk of death in elderly who used the ICU (OR = 4,095) [32]. This finding may express the greater severity of the case referred to the ICU. However, aspects related to access to these beds and the care process influence the use of this resource [32]. In general, studies report significant association and protective effect between ICU referrals and higher chances of survival in the adult population[33,34].

At the hospital level, the MBT was higher in public hospitals (16.7%) than in private non-profit hospitals (11.6%) and in private for-profit hospitals (10.0%). The adjustment of this indicator decreased the TMHB only in public hospitals, highlighting the importance of risk adjustment. There is great variability in the MHAQ between hospitals, which raises the hypothesis of possible problems related to the quality of hospital care. However, we need to consider the limits of this study, especially regarding the robustness of hospital mortality as an indicator of the quality of care, mainly related to the causal validity between process and outcome and the accuracy of risk adjustment[35,36]. Separating variation because of the severity of the case, the care process and the clinical performance of professionals and the organization is an even more complex task in elderly patients, in which these elements can be more imbricated[36,37]. However, this type of approach is understood as a screening tool, i.e., a warning signal that requires subsequent analysis in order to improve the effectiveness of care and, consequently, its quality[35,38].

In addition to the analysis of factors associated with the outcome of hospital care to elderly patients, it can be used as an indicator of the effectiveness of care [39]. Despite the limits, due to lack of information, the risk adjustment model presented reasonable discrimination capacity. Moreover, the analysis indicated that the length of hospital stay, predicted the risk of death. There was a clear improvement in comparing the predictive capacity of the models with the inclusion of length of stay. A protective effect was observed for hospitalizations longer than one day, possibly related to the seriousness of the case at the time of admission or the inadequacy of emergency care, which requires strictly timely and appropriate actions.

Another important limitation refers to the structure of hospital information system (HIS), which contained only one field for secondary diagnosis record in the period studied, in addition to underreporting, coverage and quality of available data. In this study, we observed low filling of the secondary diagnosis, that is, 13.8%. This value was lower than that described by Amaral[40], who found registration in 19.5% of admissions in the state of Rio de Janeiro; however, our value was higher than that found by Martins[30] (5.4%) in admissions throughout Brazil. These deficiencies, mainly related to the description of comorbidities and complications, impact the analyses performed.

The use of these indices, together with the other variables, could predict in an acceptable way the hospital death of the elderly, and could be improved in the future to monitor the quality of care provided. On the other hand,

despite the contribution made, the development of new research is essential to increase knowledge about the profile of hospital interventions performed in elderly patients in Brazil and their effectiveness. We found that in Brazil the number of overweight patients with the first stroke was higher than the number with normal BMI and stroke. Most of the former had less than eight years of schooling, belonged to social class C and was significantly more physically inactive. Obesity is a worldwide pandemic[41–43]. In 2010, the *Global Burden of Disease Study* reported that overweight or obesity caused 3.4 million deaths, 3.9% of life years lost, and 3.8% of disability-adjusted life years worldwide [44]. According to this study, 7% of Brazilian men and 21% of women were obese in 2013 [44]. As expected, these findings have an impact on stroke burden.

In a previous population study conducted in Joinville, it was found that 16% (CI95% 14-19) of 601 patients with first ischemic stroke were obese in the period 2005-2006. Six years later, (period from 2012 to 2013), the prevalence of obesity in 786 patients with ischemic stroke jumped significantly to 23% (95%CI, 20-27) [3]. This proportion is similar to our finding of 26% (95%CI, 24-29) in this study in five Brazilian cities.

Causality between obesity and stroke is debatable[44–46]. A meta-analysis of 21 cohort studies reported that the risk of ischemic stroke was 22% in overweight patients and 64% among obese. For "primary" intracerebral hemorrhage, the risk was not significant([4][7]). However, other studies demonstrated that the association with obesity was substantially reduced after the control of hypertension and diabetes variables for obesity[48].

The main findings in another stroke study were high prevalence of hypertension and diabetes mellitus, some connectivity problems and problems related to the recording of PoIP (ambulatory monitoring system) signals and similar profile of cardiac arrhythmias among the study groups[49].

The most frequent comorbidities were hypertension (84.6%) and diabetes mellitus (51.9%), with similar distribution between the groups studied and both comorbidities are also included in the CHADS2 and CHA2DS2-VASc scores. Although these scores provide simple methods to predict an individual risk of ischemic stroke, the risk estimated by these instruments represents only part of the overall risk (statistical concordance of 0.5). A recent meta-analysis showed that smoking is associated with a modest increase in AF and that quitting reduces, but does not eliminate, the risk associated with the disease[50,51]. However, adding smoking to the score does not improve prediction of risk of stroke or TIA[52].

The comparison between Holter and PoIP monitoring results showed a higher proportion of frequent HV and SVES detected by PoIP monitoring in the AVC / AIT and control groups, which was expected for their longer monitoring period. Studies suggested that an additional 24-hour monitoring period would increase the percentage of new paroxysmal AF diagnoses in 2-4% of stroke patients[53,54]. This confirms the efficacy of prolonged outpatient ECG in patients at risk for AF and may generate clinically significant diagnostic performance[55].

In this study, all AF episodes lasted less than 30 seconds. Although an AF episode ≥ 30 seconds is used as a parameter for AF diagnosis, 7 some authors have suggested that short AF episodes impact the risk of stroke / TIA or systemic thromboembolism[56,57]. An important finding was the lack of difference in the prevalence of atrial arrhythmias among patients with and without stroke or TIA, with similar risk for these conditions. This finding suggests that the atrial arrhythmias detected may be an epiphenomenon. Kottkamp[58] and other authors[59] suggested the presence of thrombogenic fibrotic atrial cardiomyopathy, with risk of embolic events without causal connections with atrial arrhythmias. Contractile alterations would be responsible for the increased thrombogenic risk during sinus rhythm, in addition to interatrial block and sinus node dysfunction. Even AF ablation would not be able to impede the progression of the fibrotic process[58]. Factors such as diabetes, hypertension, age, among others, would be involved in myocardial damage. In this sample, more than 80% of patients had hypertension and more than 50% were diabetics. The paradigm used in most studies is that the detection of AF would be only a matter of time, but even in one year of follow-up, AF is detected in less than half of the patients with stroke. This pioneering study monitored patients at similar risk of stroke and TIA, including a stroke group and a control group without the disease. The finding that the incidence of atrial arrhythmias was not different between the two groups is consistent with the hypothesis that a different factor from arrhythmia may be involved in the risk of stroke; one possibility is fibrotic atrial cardiomyopathy.

Ischemic stroke associated with AF is common: The differences in prevalence between sites and regions are mainly due to variation in the mean ages of the stroke populations. There was a strong and significant correlation between the mean age of the stroke cohort and the frequency of AF between sites. Compared to other regions,

Latin America had the lowest frequency of AF-related strokes; this probably reflects the lower mean age of the stroke population in Latin America, which was on average a decade lower than the stroke population in other regions. The assigned risk of AF for ischemic stroke in a given population is expected to be influenced by the life expectancy of the population[60], and this may partially explain the regional variations in the frequency of AF between high- and high-income countries in this study. This regional variability can also be partially explained by the variability in access to diagnostic tests in each center; at least hypothetically, we can assume that access to prolonged monitoring for AF is easier in high-income regions compared to upper middle-income regions.

Recent studies published since the record show that prolonged heart rate monitoring (> 1 month) identifies additional patients with strokes that present episodes of paroxysmal AF, [61,62] that are generally brief and have uncertain pathogen relevance[63]. The increase in frequency of AF-associated strokes compared to other ischemic strokes occurred despite the more widespread use of oral anticoagulants in AF patients[60]. More than half of the strokes related to AF occurred in patients with known history of AF. Although no data on antithrombotic or anticoagulant therapy are available, this finding emphasizes the importance of optimizing stroke prevention in patients with known AF. It should be recognized that precise subtyping of stroke may not be possible in all cases, even with advanced neuroimaging and vascular imaging techniques, and that some lacunar strokes may have cardioembolic or atheroembolic sources. However, previously published data on treatment with anticoagulation in AF patients with lacunar strokes show no benefit in the use of anticoagulants when compared to treatment with antiplatelet in reducing the risk of recurrent stroke[64,65].

In a study cohort, mortality at 30 days was significantly higher in AF patients compared to nonAF patients in global regions. The findings are consistent and according to the largest randomized trials, and show a significant correlation between the mean age of stroke patients and the frequency of AF, which is statistically significant and according to several recent observational data[60,66,67]. However, the study sites represented many global regions, allowing a unique comparison of AF-associated strokes around the world.

In summary, these studies provide a unique insight into the global burden of FA-related stroke. Stroke associated with AF comprises an important subset (28%; 95% CI, 25.6-29.5) of ischemic stroke patients worldwide

and is the most frequent cause of ischemic stroke in older women. These traits are potentially preventable.

The analysis of the socio-demographic characteristics of the sample allows the profile of the patients attended by a public hospital, considered the local reference center for the treatment of stroke. Thus, it was observed that the sample consisted of elderly patients, predominantly unemployed, with low income and low education and socially vulnerable. The patients presented high rates of clinical comorbidities, mainly hypertension, obesity, dyslipidemia, diabetes and smoking.

A similar profile of medical comorbidity was found in a previous study, conducted at the same hospital, which investigated the role of Chagas' disease as an independent risk factor for the occurrence of stroke[68]. Observations of mean BMI values above 25 kg / m2 and high mean blood pressure values, despite the use of drugs, draw attention to the unsatisfactory clinical management of patients before admission. Framingham's score for the sample was calculated from the clinical variables recorded. This score was developed based on information collected from population epidemiological studies conducted over 36 years and estimates the probability of stroke from clinical information[69]. The mean score observed was 21.27. This value indicates that the probability of stroke in 10 years is higher than 30% for men and 14% for women, and this value confirms the high risk profile for the development of stroke in this sample[70].

Most of the individuals observed had lacunar strokes, with predominance of lesions in the middle cerebral artery topography of the right hemisphere. NIHSS, mRS and MIF Scales were used to measure the initial severity of the ischemic event and its resulting disability. Mean results were below 5 for NIHSS and below 3 for mRS, indicating a slight stroke impact on the sample. This fact is reflected in the measurement of patient dysfunction obtained by MIF, a scale ranging from 18 (worst result) to 126 (best result) points. The mean value, 113.67, found in the sample was compatible with a mild functional deficit[71].

Despite the slight functional impact, the evaluation through structured psychiatric interview revealed the presence of mental disorders, mainly depressive and anxiety disorders, in approximately 55% of the cases. According to other studies, depression was the most frequent psychiatric disorder[72,73]. Chemerinski and Robinson[74] observed that the frequency of depression among patients hospitalized during the acute phase of the stroke is approximately 22% for major depression and 17% for minor depression. In outpatient samples (ranging from

3 months to 10 years after the stroke), the frequency is approximately 23% for major depression and 35% for minor depression, while community samples exhibit mean prevalence of 13% and 10%, respectively.

Through meta-analysis the prevalence of depression at any time after the stroke was 29%. In this sense, a systematic review of Brazilian studies that evaluated the prevalence of depression after stroke in different contexts found prevalence rates ranging from 20 to 59% [75]. Anxiety disorders are also common after stroke. Between 25% and 50% of patients develop generalized anxiety disorder (TAG) in the first months after the stroke, with a small reduction in incidence in the following three years[76]. Burton[77] reported that anxiety disorders affected 20% to 25% of patients at any time after the stroke. According to Burton[77], phobic disorders and TAG are the most common types of anxiety disorders after a stroke.

Considering that mental disorders negatively influence the recovery of patients after strokes and that factors associated with social vulnerability are risk factors that complicate treatment, the high frequency of depression and anxiety disorders draws attention to possible consequences that may result if patients are not identified and adequately treated, even when the functional impact of the stroke in patients is mild[78,79]. The relationship between depression after stroke and functional impairment is complex. Depressed patients have a significantly greater disability in daily life activities than eutymic individuals with equivalent neurological diseases[74].

VI. CONCLUSION

It is now known that stroke is one of the major causes of morbidity and mortality among patients, most of them in the elderly. It is associated with NCD, among which we mention hypertension, diabetes and dyslipidemia. This disease is more common in men, blacks and with low schooling, but in women it is more lethal, according to pre-existing data.

In Brazil, the evaluation of hospital care by means of administrative data and risk adjusted performance indicators is a little developed subject. There is also a lack of studies specifically on hospital care for the elderly.

The survey showed that the population between 30 and 69 years of age and over 70 years of age, ischemic heart disease presented the highest mortality rates in all regions of the country, both in women and men. Stroke, on the other hand, occupied the second place of the main causes of deaths among women from all regions and men

from the South and Southeast, aged between 30 to 69 years.

Our data brings to light important information, from causes, motor and emotional after-effects, and the lack of information on quality of care data (both clinical and diagnostic) and hospitalization of these patients with stroke. This shows the importance of this systematic review, and of new studies that can elucidate and bring more data about this gap within the stroke studies.

Thus, new methodologies and analyses need to be developed on the effects of the multiplicity of chronic diseases, which affect the elderly more intensely. Considering this context, this work contributes to the Brazilian production, since it has analyzed the studies that deal with strokes in Brazil, gathering the available information.

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