

Original Paper

Knowledge about Stroke in Belo Horizonte, Brazil: A Community-Based Study Using an Innovative Video Approach

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Keywords

Stroke education · Risk factors · Stroke in developing countries · Stroke knowledge

Abstract

Background and Purpose: Stroke is a leading cause of death in Brazil. Knowledge about the clinical manifestations of stroke as well as its risk factors and its management is still poor in the country. We intended to assess the stroke knowledge of an urban population in Belo Horizonte, Brazil. **Methods:** Individuals assisted by a basic health unit were interviewed between February and August 2014. After demographic data collection, the participants were asked to watch a video that consisted of a person presenting stroke signals and they were asked to answer questions about the condition shown on the video. Afterwards, they answered a semi-structured questionnaire to evaluate their stroke knowledge. **Results:** A total of 703 people were interviewed (62.1% female, mean age 46.7 years). Recognition of a person having a stroke on the presented video was achieved by 56.1% of the subjects. Female sex ($p = 0.029$) and contact with someone who had had a stroke (family member [$p < 0.01$], neighbor [$p < 0.05$]) increased the odds of correctly identifying the condition showed on the video. The most commonly mentioned clinical manifestations of stroke were weakness (34.7%) and speech disturbance (31.6%). Stroke risk factors that were most named were “unbalanced diet” (42.3%) and hypertension (33.7%). Most participants (66.8%) said they would call the emergency medical services, while 17.8% would go directly to a hospital. Only 17 subjects knew thrombolytic therapy for acute stroke. **Conclusion:** Female sex and a family history of stroke increased the odds of recognizing the signs of stroke. Knowledge about the clinical manifestations, risk factors, and management of stroke was low in the studied population.

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Introduction

Stroke is the third main cause of death worldwide and one of the main causes of permanent disability among adults in developed countries [1–3]. In Brazil, the incidence of ischemic stroke varies from 105 to 137/100,000 inhabitants, and patients with stroke exhibit high prevalence rates of ischemic heart disease, hypertension, and diabetes mellitus [4–6].

Intravenous administration of tissue plasminogen activator (tPA) to patients with acute ischemic stroke increases the odds of good clinical outcome by 30% [7]. However, tPA can only be administered within the first 4.5 h after the onset of an event, which limits the scope of this therapeutic resource. Currently, only 3–5% of patients diagnosed with ischemic stroke receive tPA treatment [8, 9]. This low rate is predominantly due to difficulties in the identification of the main clinical manifestations of stroke by the general population [9]. In Brazil, the rate of thrombolytic treatment in systematic studies varies from 1.1% [10] in the north-eastern region and 4.6% [11] to 8.9% [12] in the southeast.

Some studies have shown that campaigns on television and in printed materials are good tools to improve the population's awareness about stroke and the need to contact emergency services (in Brazil, Mobile Emergency Care Service – Serviço de Atendimento Móvel de Urgência/SAMU) [13, 14]. However, multimedia campaigns are usually expensive. Thus, the development of sustainable awareness strategies that may be replicated by governmental agencies, independent organizations, academic societies, and volunteer groups is important [14].

The aim of the present study was to assess the knowledge of a Brazilian urban population about the signs and symptoms of stroke and to evaluate the magnitude of the correlation between this knowledge and independent factors using an innovative approach including a video presenting an acute stroke simulation.

Methods

The present cross-sectional study was performed in the area covered by the São Bernardo basic health unit located in the northern area of Belo Horizonte (Minas Gerais, Brazil). This basic health unit provides care to 8,343 individuals residing in 2,756 households distributed across three areas according to their socioeconomic level. A total of 673 households were excluded from the study due to inaccessibility, resulting in a final sample of 2,083 households. The interviews were performed between February and August 2014 by trained medical students.

We actively searched for residents of all households in the area targeted by the study. Individuals aged 13–80 years without any condition hindering them from responding to the questionnaire and who agreed to sign an informed consent form were considered eligible. Individuals under 18 years of age had the informed consent forms signed by their legal guardians. All of the targeted households were visited by the researchers, and only one resident per household (usually the first one to answer the door) participated in the study. When the first person that answered the door was unable to answer the questionnaire, the researcher made a random selection among the other residents of the household. Residents who could not be located after two visits and residents who refused to participate were excluded from the study. The sample was stratified according to age range (01–20, 21–30, 31–40, 41–50, and >50 years), education level (measured as years of formal schooling), and sex.

First, the participants watched a video featuring an actor simulating three important signs of stroke: facial asymmetry, upper limb weakness, and speech problems (dysarthria).

Table 1. Questionnaire applied to the population assisted by São Bernardo basic health unit

Variables	Aspects evaluated
Demographics	sex, age, education level
Recognition of any clinical manifestation shown on the video as a stroke?	facial asymmetry, upper limb weakness, speech disturbance
Previous contact with someone who had a stroke?	family member, neighbor, respondent, none
Clinical manifestations of stroke	open-ended question
Risk factors for stroke	open-ended question
Action to be taken in the setting of an acute stroke	call EMS (SAMU), go to hospital, go to emergency department, go to basic health unit, stay at home
EMS (SAMU) activation	knows EMS telephone number
Acute stroke treatment	knows tissue plasminogen activator, knows time window for thrombolytic therapy

EMS, emergency medical service; SAMU, Serviço de Atendimento Móvel de Urgência (Mobile Emergency Care Service).

Then, they were asked to determine which disease best explained the case presented. The participants who mentioned stroke (more than one answer was allowed) were requested to indicate the symptoms that led them to the diagnosis and whether they had had previous contact with a stroke patient. Next, two open-ended questions were posed (one on the clinical manifestations expected in stroke and the second on the main risk factors related to stroke). The questionnaire ended with structured questions on the actions that should be taken upon noticing that someone has just suffered a stroke, whether the participants knew the SAMU phone number, and whether they were aware of the existence of thrombolytic treatment with intravenous tPA (Table 1).

Statistical Analysis

Data are reported as mean and standard deviation or median or interquartile range when appropriate. Categorical data are reported as absolute and relative frequency of occurrence. Categorical variables were compared with the χ^2 or the Fisher exact test. The magnitude of the statistical association between knowledge about stroke and the analyzed independent factors was assessed using odds ratios obtained through logistic regression. The significance level for intergroup differences was set at 5%.

The data analysis was performed in several steps. The first step consisted of a univariate analysis in which all variables that exhibited an association with stroke recognition at a significance level of $p < 0.20$ were included. The multivariate analysis was performed in two stages. First, each block of variables (sociodemographic, previous contact with a stroke patient, previous knowledge of the signs and symptoms of stroke, knowledge of risk factors for stroke, and knowledge of actions when witnessing a possible case of stroke) was assessed separately. The variables that exhibited statistical significance at $p \leq 0.05$ were kept in the corresponding block. Next, the blocks were sequentially added into the model in the aforementioned order, and the models with $p > 0.05$ after each new addition were eliminated. The final model contained only variables with $p \leq 0.05$. The analysis was performed using the statistical package Stata10 (StataCorp, College Station, TX, USA).

Table 2. Demographic characteristics of the studied population

Variables	n (%)
Sex	
Female	437 (62.1%)
Male	266 (37.9%)
Age	
≤20 years	39 (5.6%)
21–30 years	109 (15.5%)
31–40 years	121 (17.1%)
41–50 years	128 (18.1%)
>50 years	306 (43.6%)
School years	
<9 years	337 (48%)
≥9 years	366 (52%)

Table 3. Most frequently recognized stroke clinical manifestations and risk factors by the studied population

Clinical manifestations	n (%)	Risk factors	n (%)
Weakness	244 (34.7%)	Inadequate diet	297 (42.3%)
Speech problems	222 (31.6%)	Hypertension	237 (33.8%)
Facial asymmetry	166 (23.6%)	Sedentarism	199 (28.2%)
Headache	57 (8.1%)	Emotional stress	169 (24.0%)
Memory/cognition problems	57 (8.1%)	Alcohol consumption	152 (21.6%)
Pain	45 (6.4%)	Smoking	148 (21.0%)
Dizziness	32 (4.6%)	Dyslipidemia	65 (9.3%)
Chest pain	31 (4.5%)	Diabetes mellitus	61 (8.7%)
Dyspnea	9 (1.3%)	Obesity	37 (5.3%)
Tachycardia	2 (0.3%)	Family history	13 (1.9%)
		Advanced age	7 (1.0%)
		Carotid stenosis	3 (0.4%)
		Previous stroke/TIA	2 (0.3%)

TIA, transient ischemic attack.

Results

From the eligible population, 703 individuals responded to the questionnaire after watching the aforementioned video (23 individuals refused to respond, and none was found at 1,357 households after two visits). Only 56% of the participants identified the symptoms as corresponding to stroke. A total of 437 participants (62.1%) were female, 397 (56.5%) were up to 50 years of age, and 367 (52.2%) had attended ≥9 years of formal schooling (Table 2).

Recognition of the symptoms shown in the video as corresponding to stroke was more frequent among females ($p < 0.05$). Subjects aged 21–30 years had a worse performance in stroke recognition ($p > 0.05$). The education level was not associated with a higher rate of stroke recognition (univariate and multivariate analyses).

The clinical manifestations of stroke most frequently recognized by the participants were motor weakness (34.7%), speech problems (31.6%), and facial asymmetry (23.6%) (Table 3). The participants also related other clinical manifestations to stroke, including headache (8.1%), memory or cognition problems (8.1%), pain (6.4%), dizziness (4.6%), chest pain (4.5%), dyspnea (1.3%), and tachycardia (0.3%).

Table 4. Variables associated with greater recognition of stroke shown on the video

Variables	Univariate analysis		Multivariate analysis	
	%	<i>p</i> value	OR (CI)	<i>p</i> value
Female sex	65.6	0.03	–	–
Previous contact with a neighbor who had a stroke	20.6	0.02	–	–
Previous contact with a relative who had a stroke	56.6	0.001	1.54 (1.03–2.30)	<0.05
Identifies hypertension as a risk factor for stroke	41.7	<0.001	1.84 (1.21–2.81)	<0.01
Identifies diabetes mellitus as a risk factor for stroke	11.3	0.008	–	–
Identifies sedentarism as a risk factor for stroke	31.6	0.04	–	–
Identifies obesity as a risk factor for stroke	7.2	0.03	–	–
Identifies smoking as a risk factor for stroke	23.9	0.05	5.82 (1.57–21.56)	<0.01

Table 5. Actions to be taken by the studied population in the setting of a acute stroke

Actions	<i>n</i> (%)
Call EMS (SAMU)	468 (66.8%)
Go to a hospital	124 (17.8%)
Go to an emergency department	29 (4.2%)
Go to a basic health unit	19 (2.8%)
Stay at home	7 (1.0%)
Knows EMS (SAMU) phone number	328 (46.6%)
Knows fire department phone number	105 (15.0%)
Knows thrombolytic therapy	17 (2.4%)

EMS, emergency medical service; SAMU, Serviço de Atendimento Móvel de Urgência (Mobile Emergency Care Service).

The rate of recognition of the clinical symptoms of stroke shown in the video was higher among the participants with a neighbor ($p < 0.05$) or relative ($p < 0.01$) who had had a stroke in the univariate analysis. Contact with a relative remained significant in the multivariate analyses (Table 4).

The risk factors for stroke most frequently identified by the participants were inadequate diet (42.3%), hypertension (33.7%), physical inactivity (28.3%), emotional stress (24%), alcohol use (21.6%), and smoking (21%). Hypertension, diabetes mellitus, physical inactivity, obesity, and smoking ($p < 0.05$) were more frequently identified as risk factors for stroke by the participants who identified the disease in the video. In the multivariate analysis, only identifying hypertension and smoking as risk factors for stroke remained as predictors of stroke recognition based on the signs and symptoms presented in the video.

Most participants (66.8%) said they would call SAMU when facing the situation shown on the video, 17.8% would go to a hospital, some to emergency care units (4.2%) or basic health units (2.8%). Only 1.0% of the subjects answered that they would stay at home. A total of 61.6% of the participants knew the SAMU or fire department service telephone number (Table 5).

Finally, only 17 (2.4%) participants mentioned thrombolytic treatment for acute stroke, whereas none of the participants was aware of the maximum time interval for this therapy (Table 5).

Discussion

Only a little more than half of the interviewees promptly recognized the symptoms of stroke shown on the video in this community-based study in Brazil. In one study conducted in four Brazilian cities (São Paulo, Ribeirão Preto, Fortaleza, and Salvador), the rate of stroke recognition was 62.2%; however, the authors used a case report that was explained to the subjects, while in the current study a real-life video simulation was used instead [15]. The popular Portuguese term for stroke (“derrame” = spilling) was frequently used by the participants in this series as a synonym for the technical term cerebrovascular accident. In a previous study, 44.0% of the sample used the expression “derrame,” whereas only 23.6% used the expression cerebrovascular accident and 12.0% mistook the signs and symptoms for manifestations of acute myocardial infarction [16]. Interestingly, the participants in our study were also confused about these two different conditions. We attribute this finding to the wider access of the overall population to information about myocardial infarction via either the mass media or community-based health promotion actions.

The rate of stroke recognition from the video was not greater among participants with a higher education level. This finding disagrees with the results of other studies in which a higher education level was associated with better knowledge of the clinical manifestations of stroke, greater engagement in primary prevention, and more adequate behavior in the face of acute stroke in other countries [16–19]. One study conducted in São Paulo did not find an association between education level and early arrival of stroke patients to the hospital either [20]. In our study, personal contact with a relative or neighbor with a stroke facilitated the identification of this condition on the video. Practical or visual experience seems to influence the retention of the recognition of stroke symptoms among Brazilians. Thus, educational campaigns including videos similar to the one used in our study might be quite useful for teaching the Brazilian population about the signs and symptoms of stroke.

The warning signs of stroke most frequently recognized in the present study were arm weakness, speech problems, and facial asymmetry. One explanation for this result might be that these were the clinical manifestations shown on the video. Other symptoms such as headache and reasoning/memory impairment might have been described as symptoms of stroke because they were overall related to neurological diseases. The description of pain, chest pain, and shortness of breath as stroke symptoms might be related to the confusion between stroke and myocardial infarction. In one study conducted in Japan, speech problems (95.5%) and hemiplegia or hemisensory impairment (89.5%) were recognized as the main clinical manifestations of stroke [8]. Adelman et al. [21] also found that paresis (86.9%) and speech problems (82.9%) were the main warning signs of stroke identified by the nursing staff at an academic medical center. The rate of recognition of facial asymmetry as a significant sign of stroke varied from 34.7 to 90.1% in different studies [18, 22].

The participants in our study seemed to associate dietary habits with the occurrence of stroke. An inadequate diet, which according to the interviewees was a diet rich in fat and salt, was the risk factor most frequently mentioned by the participants. Such a dietary pattern is associated with poorer control of hypertension, which is the main cause of stroke. Conversely, several studies showed that a diet rich in fruit, vegetables, fish, and cereals might reduce the risk of stroke [23, 24]. Therefore, the identification of this association between diet and stroke in our study might be important in order to identify potential behavior modification strategies based on the current beliefs of our population.

The second most frequently mentioned risk factor for stroke was hypertension. Studies conducted in Brazil (30.1% [15]) and in other countries (United States, 32.3–49.0% [25, 26]; Australia, 31.8% [27]; Luxemburg, 32.0% [1]; India, 45.1% [28]) found similar rates. In two studies, one from Japan and the other from Nigeria, the percentage of recognition of hyper-

tension as the main risk factor for stroke was higher (89.1% [8] and 87.4% [29]). Physical inactivity or lack of exercise was an important risk factor for stroke for some subjects. Several studies showed that the practice of physical activity might be directly correlated with a reduced risk of stroke [30, 31]. About one-fifth of the sample associated stroke with alcohol use and smoking, respectively. In one study performed in Japan, the corresponding rates were much higher (alcohol use 78.2% and smoking 63.9%) [32]. This finding reinforces the importance of public campaigns clarifying this relationship in our country.

Some classic modifiable stroke risk factors such as diabetes mellitus, smoking, alcohol use, previous history of stroke or transient ischemic attack, and carotid artery disease were not at all or infrequently recognized by the participants. This was also the case in other studies with designs similar to ours. Indeed, although the latter two risk factors are very important, they were reported by <1% of the sample. Conversely, conditions with a weaker relationship with stroke, such as inadequate diet and emotional stress, were mentioned by many participants. The variation in the recognition of risk factors for stroke might be attributed to different local cultural characteristics and the population's exposure to awareness campaigns. For these reasons, culturally adapted individual and collective interventions need to promote more accurate knowledge about the true impact of stroke risk factors, such as hypertension.

A large proportion of the participants in the present study reported that they would call an emergency medical service (EMS) if they were near someone with a stroke. This proportion was higher than the proportion reported by other authors who assessed EMS activation in patients with suspected stroke in other developing countries [15, 16]. Studies performed in developed countries showed a high percentage of EMS activation for patients with stroke [22, 27, 32, 33], with percentages reaching 89% in Luxemburg [1]. These data have a crucial relevance because transportation and care by EMS enables patients to arrive faster to healthcare services able to provide treatments that are effective at reducing the damage caused by stroke and thus improving functional outcomes [34]. Approximately 17.6% of the participants said they would take individuals with stroke directly to a hospital without SAMU activation because this might assist the patients in arriving at an adequate therapeutic facility more quickly. Nevertheless, this practice is not recommended due to the risks associated with patient transport and the possible selection of a service that might not be prepared for the treatment of stroke. This behavior was also reported in other studies conducted in Brazil at even higher rates (27.8–38.7%) [15, 16]. Brazilian studies that assessed the actual mode of arrival of stroke patients to hospitals revealed an even more worrisome situation, with only 18% of the patients arriving via SAMU [20, 35].

Few participants reported behaviors that would result in delayed diagnosis and treatment of patients with stroke, such as taking them to basic health units (where the clinical diagnosis might be established but there are no resources for specific treatment for stroke) or staying at home. Curiously, in a study performed in Japan, the authors found that a large proportion of participants (41.8%) would prefer to call their family doctor [8]. In one study conducted in Germany, the proportion of participants who indicated that the first action in the case of stroke should be calling an EMS increased from 74 to 84% ($p < 0.001$) following an educational intervention [36]. In our study, only 61.6% of the sample knew the phone numbers of the EMS (SAMU and/or fire department service units). This proportion is too low considering the relevance of this type of information, but nonetheless is much higher than the proportion found in a study performed in other Brazilian cities (34.6%) 11 years ago [15].

Few subjects mentioned thrombolysis as a potential treatment for acute stroke, but none of these participants knew the maximum time interval for the onset of treatment. This finding is similar to the proportion found by a previous study performed in Brazil and is lower than the proportion reported by the authors of a hospital-based study conducted in São Paulo [20].

In one Chinese study, 23.3% of the participants were aware of tPA, and 59.9% knew the time window [37]. In a similar study in Italy, 26.2% of the sample knew about alteplase [33].

As its main limitation, this study was performed in a single Brazilian city, and thus the results might not accurately reflect the situation across the country. Another limitation that we faced is the low response rate (only 703 respondents in 2,083 households), but the main reason for this fact is that the researchers visited the inquiry area during business hours, a moment in the day when many residences were empty. We considered the possibility of trying to reach a larger sample of the studied population using e-mail and social media, but there was significant apprehensiveness that we might not find enough engagement of the studied population using these methods. Nevertheless, the study was performed directly in the community instead of using a convenience sample. Another strength of the present study was the use of a video in which an actor simulated some of the clinical signs of stroke. This type of resource simulates the real situation experienced by people witnessing an episode of stroke and therefore can be more accurate in reflecting participants' reaction when facing it. Besides, the video approach can even provide a new tool for the dissemination of meaningful information such as stroke signals.

Conclusion

This was the first study evaluating stroke knowledge using an innovative video approach. The results of our survey agree with various other studies conducted in Brazil and indicate that the overall population has insufficient knowledge about stroke, its main clinical manifestations, and its risk factors. Studies like ours help to build the evidence to establish the best type of educational intervention and techniques to be used in public campaigns about stroke awareness in the country.

Statement of Ethics

This study was approved by the research ethic committees of José do Rosário Vellano University and the Belo Horizonte City Government, and written informed consent was obtained from each subject.

Disclosure Statement

The authors have no conflicts of interest to disclose.

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