Stroke prevalence in a poor neighbourhood of Sao Paulo, Brazil: applying a stroke symptom questionnaire

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Available at: http://works.bepress.com/paulo_lotufo/3/
Stroke prevalence in a poor neighbourhood of São Paulo, Brazil: applying a stroke symptom questionnaire

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Background Brazil has one of the highest stroke mortality rates in the world, these rates are most endemic in the poor. We verified the prevalence of stroke in a deprived neighbourhood in the city of São Paulo, Brazil and compared it with other surveys worldwide.

Methods A questionnaire with six questions concerning limb and facial weakness, articulation, sensory disturbances, impaired vision, and past diagnosis of stroke was completed door-to-door in a well-defined area of 15,000 people. Questionnaires were considered positive when a participant answered two or more questions about stroke symptoms or the presence of stroke being confirmed by a physician, or at least three questions in the positive, even if not confirmed by a doctor.

Results Of the 4,496 individuals over 35-years old living in the area, 243 initially screened positive for stroke. The age-adjusted prevalence rate for men was 4.6% (95% confidence interval 3.5–5.7). For women, the prevalence rate was 6.5% (95% confidence interval 5.5–7.5); when considering only one question, the rate was 4.8% (95% confidence interval 3.9–5.7). The most commonly reported symptoms were limb weakness and sensory disturbances. Hypertension and heart disease were the conditions most commonly associated with previous stroke.

Conclusion Stroke prevalence rates were higher in this poor neighbourhood compared with other surveys.

Key words: Brazil, prevalence, stroke epidemiology, stroke, WHO STEPS

Introduction Cerebrovascular disease mortality rates in Brazil are the highest in the Americas, especially in the most deprived areas and black populations (1–4). New descriptions of stroke incidence in middle-size and small towns in Brazil were recently published (5, 6). No data are available regarding stroke prevalence in deprived areas of metropolitan Brazil. Stroke prevalence for South America has few studies, with only two studies performed in the rural areas of Bolivia (7) and Ecuador (8), and in one small town in Argentina (9). Prevalence studies published about stroke are not homogeneous around the world considering age, city size, number of participants, and type of questionnaire. Most recent surveys of stroke were performed in the city-states of Singapore (10) and Taiwan (11), and in the large cities of Lagos, Nigeria (12) and Kolkata, India (13). In Berlin, Germany, a mail survey directed to 40,000 people applied a symptom questionnaire to verify stroke prevalence (14). Surveys have only addressed stroke prevalence among the elderly in Italy (15), Spain (16), and Korea (17). Data from developed countries have been obtained from surveys of the adult population performed more than 20-years ago in Italy (18), Finland (19), New Zealand (20), the Netherlands (21), the United States (22), and England (23, 24). The only data with national coverage in a large country were derived from the National Health and Nutrition Examination Surveys in the United States (25).

Although some data on stroke mortality, case fatality, and incidence are available in Brazil (3–6), information about the prevalence of stroke is very scarce in Brazil, with one recent publication of data from a small town (26). This study addresses the prevalence of stroke in an area of the city of São Paulo that is covered by the Family Health Program of a primary care unit in the district of Butantan, using the World Health Organization (WHO) stepwise approach to stroke surveillance (STEPS Stroke), which is a simple strategy that permits the creation of stroke registers in several scenarios, including prevalence studies (27).

Methods The ‘Estudo de Mortalidade e Morbididade do Acidente Vascular Cerebral’ (EMMA) was a study carried out in São Paulo, Brazil that applied the strategy of WHO STEPS Stroke, including

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Conflict of interest: None declared.

Funding: This study received grants from the Fundação de Amparo a Pesquisa do Estado de São Paulo, São Paulo, Brazil.

DOI: 10.1111/j.1747-4949.2010.00538.x
events in hospital (step 1), fatal events (step 2), and nonfatal cases (step 3). A more detailed aspect of the EMMA design was described previously (28). The study protocol was approved by the Institution Review Board of Hospital Universitario of the University of Sao Paulo. All participants provided signed, informed consent. Data collection was carried out in two phases.

Population and study area

The study population live in the west side of the city of Sao Paulo, which comprises the sanitary district called Butantan, totaling 424,377 inhabitants in 2009. Cardiovascular diseases represent 40% of all deaths in Butantan, as well as in the city of Sao Paulo, and stroke mortality represents one-quarter of all vascular deaths. In this area, there are 16 primary care facilities, and one community teaching hospital owned by the University of Sao Paulo. The area of one of these primary care units (São Jorge) was used for step 3 of WHO STEPS Stroke. São Jorge in the city of Sao Paulo is one of the poorest neighbourhoods with 15,000 inhabitants, one-third of them living in slums.

The high rate of poverty means that residents are covered by a primary care unit applying the rules of the 'Family Health Program', in which a community health worker makes visits every month, and all the families in his/her area are supervised by a nurse and a family physician. For each primary care unit, six family physicians are assigned full time. Each family physician works with six community health workers. A health agent has to visit all of the households of his/her area once a month.

First, most of the families were contacted during the monthly visit in February 2008. When no one in the family was contacted in February, a second visit in March, or even a third visit in April–June 2008, was carried out. Community health workers were trained by physicians and one of us (I.M.A.) to conduct a questionnaire identifying anyone in the household who suffered a possible stroke. The screening procedure was a face-to-face interview with one of the people living in the house, generally the mother/spouse that answered questions about stroke symptoms for all people over the age of 35-years living in the house. The questionnaire included five questions about stroke symptoms: limb weakness (arm or leg), facial weakness, articulation problems, sensory disturbances, and impaired vision. When someone in the house screened positive for stroke symptoms, the trained interviewer conducted a longer questionnaire directly with the individual person (same day or different day) asking again about stroke symptoms and more information about sociodemographic characteristics, frequent comorbidities, and use of medication, as well as applying modified Rankin and Barthel scales. The interviewer also asked to the patient if he/she had a stroke; if the answer was yes, they were asked if he/she was treated by a doctor, where he/she was treated, and if a CT brain scan was performed, they asked about the type of stroke.

Questionnaire

The questionnaire used for the present study was based on the questionnaire used in the Memory and Morbidity in Augsburg Elderly (MEMO) study (29) and another study (14).

A questionnaire was considered positive when patients answered positive to two or more questions about stroke: (five asking about symptoms — limb weakness, facial weakness, articulation problems, sensory disturbances, and visual impairment — and one asking directly about previous stroke) confirmed by a physician or when he/she refers at least three positive questions (of the same six questions) not confirmed by a physician. As in the original paper of the MEMO Study, we have also compared stroke diagnosis using all six questions as specified above with the use of only one question asking about previous stroke confirmed or not by a physician.

The questionnaire was validated previously by a neurologist in a small sample of participants and found to have a sensitivity of 72.2% and specificity of 94.4%, a positive likelihood ratio of 12.9, and a negative likelihood ratio of 0.29 (30). At the same time, the interviewer queries visual symptoms, the answers presented data that suggested the most common visual symptoms in stroke patients as diplopia, loss of central vision, or loss of vision on one side, and others as in the original questionnaire.

Data analysis

Eligible individuals were included in the prevalence figures if, at any time in their lives up to 1 January 2008 (prevalence day) if they had experienced a clinical stroke, regardless of the presence or absence of symptoms or signs of disease. Point prevalence was calculated according to gender in five age strata. Prevalence was determined as the number of cases per 100 persons with the 95% confidence interval (CI). Results were presented as proportions or means with standard deviation. The world population was used as a reference for age-adjusted rates. χ² or analysis of variance was used as appropriate. Significance was set at P < 0.05. All analyses were performed using statistical package for social sciences version 16.0.

All data collection was performed by trained interviewers and medical researchers according to the STEPS Stroke manual. Quality control was assured by cross-checking information, which was performed by the three medical coordinators of the EMMA study.

Results

A total of 4496 people ≥35-years of age live in the Sao Jorge area. Of these inhabitants, 618 (54% men) had moved, left home early, or returned late; 204 (no gender difference) refused to participate; and 13 individuals were incapacitated to answer the questionnaire and thus were excluded from the analysis. Of the 582 people who screened positive in the family questionnaire, five did not answer the individual questionnaire, leaving
577 people, of whom 243 answered the questionnaire positively and were classified as stroke patients (Fig. 1).

Table 1 shows the frequency of stroke according to age strata, comparing diagnosis of stroke performed by the answer with the six questions (five about symptoms and one about previous stroke using the criteria described in methods section) and using only the question about previous stroke. Women answered more questions positively than men did. The prevalence of stroke increased according to age strata for women when considering both criteria. For men, when using only history of stroke, a positive trend was observed over the age strata. The accrued prevalence was different when considering criteria for women; consequently, the gender gap was present only when we applied the six questions, but not when only applying the question about past stroke. Despite these considerations regarding data of relevance to public health, the prevalence of stroke was approximately 5% for both genders for individuals aged 35-years or over.

Table 2 shows the prevalence of specific symptoms according to age and gender. A positive trend with age was observed only among women for three symptoms: limb weakness, facial weakness, and articulation problems. Sensory disturbances were the isolated symptom most commonly reported by participants and facial weakness was the least reported. Most stroke symptoms reported by participants were confirmed by a physician, with a differential proportion of certainty: 70-5%
Table 2. Point estimations and 95% confidence intervals (95% CI) of stroke-related symptoms according to age strata by gender

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Participants (n)</th>
<th>Limb weakness</th>
<th>Facial weakness</th>
<th>Articulation problems</th>
<th>Sensory disturbances</th>
<th>Visual impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35–44</td>
<td>553</td>
<td>31 (16–55)</td>
<td>21 (3–63)</td>
<td>21 (1–70)</td>
<td>31 (1–70)</td>
<td>21 (1–70)</td>
</tr>
<tr>
<td>55–64</td>
<td>279</td>
<td>29 (7–110)</td>
<td>28 (5–76)</td>
<td>28 (5–76)</td>
<td>28 (5–76)</td>
<td>28 (5–76)</td>
</tr>
<tr>
<td>65–74</td>
<td>142</td>
<td>29 (9–51)</td>
<td>29 (9–51)</td>
<td>29 (9–51)</td>
<td>29 (9–51)</td>
<td>29 (9–51)</td>
</tr>
<tr>
<td>P for trend</td>
<td>0.03</td>
<td>0.44</td>
<td>0.43</td>
<td>0.43</td>
<td>0.60</td>
<td>0.62</td>
</tr>
<tr>
<td>Age adjusted</td>
<td>6.6</td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P for trend</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>0.50</td>
<td>0.25</td>
</tr>
<tr>
<td>Age adjusted</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
</tr>
</tbody>
</table>

Data are given as point estimation (95% confidence interval) (number of cases) unless otherwise noted.

Discussion

In this population-based study addressing the prevalence of stroke in a poor area of Sao Jorge in the city of Sao Paulo, the age-adjusted prevalence of stroke was 4.6% for men and 6.5% for women. An upward trend in the prevalence rate was observed according to age for women but not for men. Isolated stroke-related symptoms were reported more often by women, but the frequency of symptoms was similar for both genders. The most frequent risk factors and/or medical conditions reported by stroke survivors were a history of high blood pressure, dyslipidemia, heart disease, and, for women, past use of contraceptive hormonal therapy. Although there have been some papers about incidence, case fatality, and mortality associated with stroke in Brazil (5, 6), the present study is the first to address the prevalence of and associated disabilities in a large city of Brazil that applies an international questionnaire for stroke symptoms. Most stroke patients in this sample had few disabilities, and the peak prevalence rates were in individuals 65–74 years of age.

The questionnaire used in the present study was based on the questionnaire used in the MEMO study in Augsburg and in a large prevalence study in Berlin (14, 29). In spite of a high concordance between the German surveys and ours, there were some important differences between the two studies in the prevalence of symptoms. The most frequent symptoms in the German study (29) were limb weakness and impaired vision (both 39%), followed by sensory disturbances (34%), articulation problems (26%), and facial weakness (13%). In our sample, the most common symptoms were limb weakness and sensory disturbances, followed by articulation problems, facial weakness, and visual disturbances. The presence of visual disturbances was not significantly different between male stroke patients and individuals who had not suffered a stroke in our sample (P = 1.0). At the same time, the interviewer, while asking the question about visual symptoms, he/she showed a picture of the most common visual symptoms in stroke patients as diplopia, loss of central vision, or loss of vision on one side, and others as in the original questionnaire. Therefore, the question is not focused in common unspecified symptoms not related to stroke. The low-income sample included in the study has little access to ophthalmologic resources in the area and some kind of misclassification is still possible.
The comparison with other survey using the same questionnaires will be useful in understanding some findings in our sample (14). In the previous survey in Berlin, participants were older than in our sample. The same questionnaire was mailed to 75,720 households with at least one person ≥50 years old, and 28,090 (37.5%) responded. Prevalence was obtained by combining a positive answer to a previous history of stroke and/or prior impaired vision and poor articulation problems. A prevalence of 7.8% was found for men and 7.4% for women using the combination of questions, and a prevalence of 4.9% in men and 4.4% in women using only the question about self-reported stroke diagnosed by a physician. We used the same strategy, except that the interviewer asked the questions face-to-face at home, sometimes using proxies. Using the same questionnaire, we also created a combined model that included questions about symptoms and a previous history of stroke. Another difference was that we had access to 81.5% of the people aged 35 years or more who lived in the area compared with 37.5% in the Berliner stud.

We compared this model with a blinded neurological examination and disclosed a sensitivity of 72.2%, specificity of 94.4%, positive likelihood ratio of 12.9, and negative likelihood ratio of 1.29 (30).

Our study was designed for two phases with a more detailed questionnaire at the second phase for those who screened positive in the previous phase. One limitation was that only a sample of participants in the second phase of the study was examined by a neurologist, in contrast to several other studies in which all participants were examined by a neurologist. However, the positive likelihood ratio of this validation study was 12. Another point was that men were less likely found at home, probably due to temporary out-of-town jobs, mainly in the construction industry, an economic activity common in this neighbourhood. Despite our efforts in training and supervising community health workers, it will be possible to a margin of non-differential misclassification is possible due to restrictions to perform an interview in a poor neighbourhood.

In contrast to other surveys published from countries with low and middle incomes (7–13), stroke prevalence was higher among women compared with men, which can be explained by gender differences caused by either asymmetric rates of incidence and case-fatality of cerebrovascular diseases or competing causes of death that are more frequent among young men.

Recently, a review of stroke epidemiology studies worldwide showed that the incidence of stroke is 33% higher among men, but the 28-day case fatality rates were significantly lower for men (19-7%) than for women (24-7%) (31). However, preliminary data from the EMMA study revealed that the case-fatality rates (and 95% CI) at 10 days were 9-0 (5-3–14-1) for men and 5-4 (2-5–10-0) for women; 13-3% (8-8–19-0) for men and 12-7% (8-0–18-7) for women at 28 days; and 19-1% (13-8–25-3) for men and 21-7% (15-7–28-7) for women at six-months for 144 first-ever hospitalised stroke patients in the same sanitary district of the city where the present survey was performed (32). If stroke lethality does not explain completely why men have lower prevalence rates, the different age distribution of stroke mortality between gender also did not permit an explanation. Using the official death statistics files in the Sao Jorge area (2004–2008), we detected that the proportion of stroke deaths under 55 years old was similar for both genders. In other hand, the impact of competitive all-cause of deaths can explain more because in the same period 39% of male deaths were under 55 years old in comparison to 26.8% of female premature deaths. It is explained by the male burden of coronary heart disease, alcohol-related disorders, and homicides with an epidemic pattern in the late 1990s (33).

The stroke prevalence rates in all surveys cited previously were lower than those obtained in the Sao Jorge area in the city of Sao Paulo. The numbers closest to ours were published for Chinese living in Singapore (10). The comparison of our findings to other studies must be interpreted by considering the method of evaluation, the place (rural, small town, or city), and mainly, the pattern of incidence and case-fatality rates; in other words, the pace of the cardiovascular epidemiological transition. In South America, three surveys were performed, two in the rural areas of Atahualpa (Ecuador) (8) and Cordillera
(Bolivia) (7), and the prevalence rates for the sixth and seventh decades of life were almost one-tenth of the rate in our study, but the number of cases was too low to permit comparisons. The other South-American survey was performed in the small town of Junin, Argentina (9), where they accrued 143 cases of stroke and obtained prevalence rates lower than that of our sample. Although the age strata classification was not compatible between the two studies, the peak rates for men aged 60–69-years were similar to our findings. Importantly, Junin, Argentina has a more affluent and ethnic/racially homogenous population from European ancestry. Two other studies in large cities, Lagos, Nigeria (12) and Kolkata, India (13), had lower prevalence rates that can be explained by much higher case-fatality rates in the cities compared with the results from our community hospital in EMMA step 1 (31).

On the other hand, when we contrast our findings with those from high-income countries (14–25), we obtained the highest stroke prevalence rates. For all of these surveys, the peak prevalence was for those over 80-years of age, and in our study the peak frequency occurred from 55–74-years of age, showing that cerebrovascular disease incidence is still premature in our population. Several studies have shown the impact of socioeconomic variables on stroke incidence. One of the studies, the US cohort Established Populations for the Epidemiologic Studies of the Elderly, revealed a twofold risk of stroke until 75-years of age for people in the fourth quartile of income and/or education compared with the richest or most educated quartile (34). In addition, the 2005 US stroke survey showed an inverse relationship between number of years in school and the diagnosis of stroke, and it also revealed that Blacks reported twofold more stroke events than Caucasians (25). The Sao Jorge area is one of the poorest neighbourhoods of the city, with almost one-fifth having a formal education of at least the first year of high school. Moreover, the racial/ethnic distribution in our sample (Caucasian, 39.8%; mixed, 40.2%; Black, 15.6%) was different than that of the whole city (Caucasian, 70%; mixed, 22%, Black, 6%).

We did not have data about incidence in the Sao Jorge area, but it is possible to consider that the net effect of poverty is responsible for a higher premature of stroke incidence. This can explain the higher prevalence rates associated to particularly lower case-fatality rate at Sao Jorge area. Examining exclusively the 14 studies performed after the year 2000 about stroke incidence summarised by Feigin and colleagues, the age-adjusted incidence rate of the town of Matao, Sao Paulo (130 x 1 000 000) was ranked third, only with values below Uzhhorod, Ukaraine (238 x 1 000 000) and Mumbai, India (151 x 1 000 000). In contrast, the 30-day case fatality in Matao (18.5%) was ranked 10th place (35). Reemphasising, the ongoing EMMA step 1 are revealing a lower lethality value than described in Matao (32). Thus, it will possible to speculate that there is in the Sao Jorge area a combination of a higher stroke incidence with good medical resources provided by the teaching hospitals that are referral institutions for the primary care units.

Although some kind of overestimation is possible, especially for women, due to the characteristics of the questionnaire, our study is representative of the poorest areas of large cities, where the burden of infectious diseases exists, but the impact of chronic diseases, especially hypertension, is still higher.

In conclusion, the prevalence rates in a deprived area of a district in the city of Sao Paulo, Brazil were the highest for cerebrovascular diseases mainly among women.

Acknowledgements

Dr Lotufo and Dr Bensenor received an award grant for established investigators from Conselho Nacional de Pesquisa, Brasil, Brazil.

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