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STROKE MORTALITY IN SÃO PAULO (1997-2003)

A description using the Tenth Revision of the International Classification of Diseases

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ABSTRACT - Stroke mortality rates are higher in Brazil when compared to other countries. The city of São Paulo has a good system of mortality surveillance that allow us to describe the epidemiology of the stroke in the city. Our aim was to describe the stroke mortality pattern by gender and age characterizing the ischemic/hemorrhagic ratio. We categorized mortality data by gender and a 10-year age-strata from 30-39 years-old to 70-79 years-old. To avoid random variations, we calculated the mean of all deaths occurred during the period of 1997 to 2003. Mortality rates were calculated using the population from the Brazilian National Census occurred in 2000. The proportion of deaths from all types of stroke related to all cardiovascular among women was higher when compared to men, mainly during middle-age. In other hand, the risk of stroke death is always higher among men during all ages. Ill-defined stroke certification is more common as underlying cause of death above the 60 years-old (40 per cent).Intracerebral hemorrhage was the most frequent cause of stroke death for both sexes from 30 to 59 years-old. Subarachnoideal hemorrhage was much more frequent as cause of death among women than in men. The ratio between ischemic/hemorrhagic (both subtypes) was 0.59 for men and 0.56 for women. Concluding, the magnitude of hemorrhagic stroke is still higher in São Paulo city, with an special burden to middle-aged people for both gender.

KEY WORDS: cerebrovascular disorders, mortality, disease classification, epidemiology.

Mortalidade pela doença cerebrovascular em São Paulo (1997-2003): descrição utilizando a Décima Classificação Internacional de Doenças

RESUMO - A mortalidade pela doença cerebrovascular (DCV) é ainda elevada no Brasil quando comparada a outros países. O município de São Paulo tem um sistema de informação de mortalidade de boa qualidade que nos permite avaliar a epidemiologia da DCV. O objetivo do estudo foi descrever o padrão por gênero e faixa etária do diferentes tipos de doença DCV. Para essa tarefa, as informações de mortalidade foram estratificadas por gênero e faixas etárias decenais desde os 30-39 anos de idade até os 70-79 anos de idade. Para evitar flutuações ocasionais, calculou-se a média dos óbitos ocorridos no período de 1997 a 2003.As taxas de mortalidade foram calculadas usando-se a população determinada no Censo de 2000. A proporção de mortes por DCV em comparação com o total de óbitos de origem cardiovascular foi maior entre as mulheres, principalmente na meia idade. Por outro lado, a diferença do risco de morte por entre homens e mulheres aumentou progressivamente com o avançar da idades, com os homens apresentando sempre os valores mais elevados. A DCV não especificada como isquêmica ou hemorrágica foi a causa mais comum de morte por DCV a partir dos 60 anos. No entanto, a hemorragia intracerebral foi a causa mais freqüente para ambos os sexos dos 30 aos 59 anos. A hemorragia subaracnoídea foi causa muito mais freqüente entre mulheres do que em homens. A razão entre mortes por DCV isquêmica em relação a hemorrágica (ambos subtipos) foi 0,59 para homens e 0,56 para mulheres. Concluindo, a magnitude dos tipos hemorrágicos da DCV é ainda bastante elevada em São Paulo quando comparada a de outros países.

PALAVRAS-CHAVE: doença cerebrovascular, mortalidade, classificação de doenças, epidemiologia.

Stroke mortality rates are declining in Sao Paulo, Brazil since the 1980's[1-3]. However the burden of deaths from cerebrovascular disease (CVD) is still high in the city of São Paulo as well as in other Brazilian metropolitan areas[1,4] In 1996, the Ministry of Health of Brazil adopted the 10th Revision of the International Classification of Diseases (ICD-10) whose categories for stroke are distinct from the previous edition. After the introduction of a new revision of the ICD, there was an improvement in

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the quality of death certification, due to the use of new simple rules to code CVD. One specific question to stroke epidemiology is to verify if using this new classification, the proportion of ill-defined CVD decreases, with more diagnoses of ischemic and hemorrhagic stroke deaths.

Considering both official health statistics and coroner autopsy services, the city of São Paulo (Brazil) has a complete and complex system of mortality surveillance that allow us to verify the stroke subtypes' proportion by age-strata and gender. So, the aim of this study is to describe the distribution of the subtypes of stroke deaths according to age-strata and gender.

METHOD

Mortality data were obtained from the city of Sao Paulo health statistic system (PRO-AIM, Programa de Aprimoramento das Informações de Mortalidade), and they were categorized by gender and a 10-year age-strata (from 30-39 years-old to 70-79 years-old). To avoid random variations, we used the mean of all deaths occurred during the period of 1997 to 2003.

Mortality rates were calculated using the population from the Brazilian National Census in 2000. This year was the mid-point of the period 1997-2003. Adjustment for age was obtained by direct method using as standard the whole population of the city of Sao Paulo from the 2000 Census.

RESULTS

Figure 1 shows the proportion of deaths from all types of stroke considering all deaths classified as cardiovascular diseases by gender. The proportion of deaths from stroke among women is higher when compared to men. This proportion decreases in elderly men and women compared to middle-age strata. However, Figure 2 shows that the gap among the mortality rates for stroke between men and women are progressively wider according to increasing age-strata categories.

Table 1 shows that ill-defined stroke is the most common subtype of death certification for stroke for both gender among all people of 30 to 79 years-old with a range of 10 to 40 per cent, due to the eldest strata. However, in the age-strata of 40 to 59 years-old, intracerebral hemorrhage was a more frequent cause of the death for men and women. Subarachnoid hemorrhage was much more frequent as a cause of death among women compared to men. Age-gender specific mortality rates (Table 2) are higher among men, except for subarachnoid hemorrhage. Figure 3 shows the age-adjusted mor-

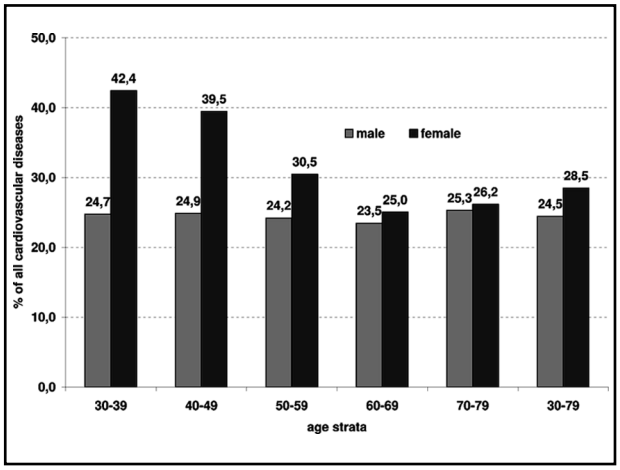

Fig 1. Proportion of stroke deaths among all cardiovascular diseases according to gender and age-strata in Sao Paulo City, 1997-2003.

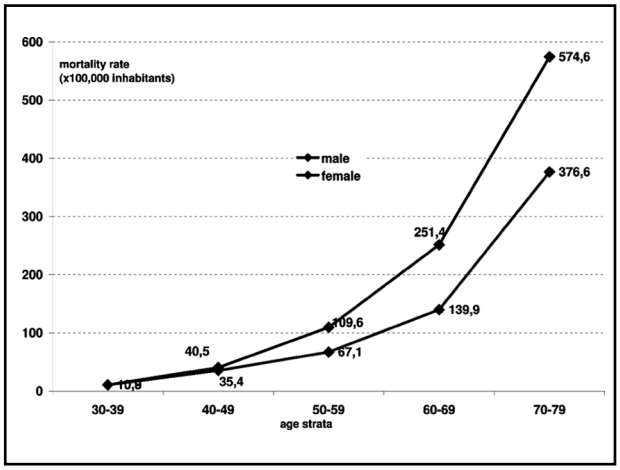

Fig 2. Stroke mortality rates according to gender and age-strata in Sao Paulo City, 1997-2003.

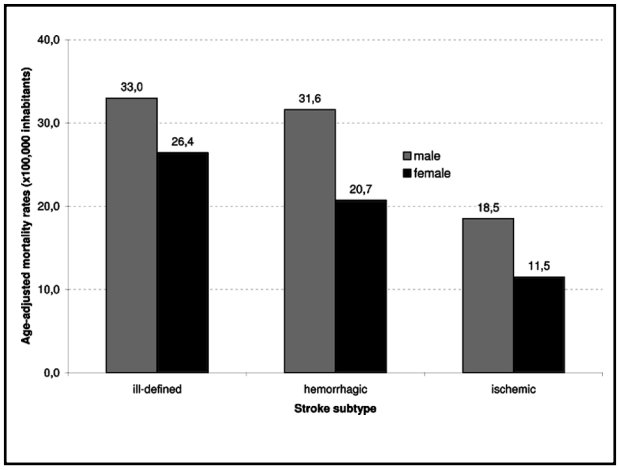

Fig 3. Comparison of age-adjusted stroke subtypes mortality rates between gender in Sao Paulo, 1997-2003.

Table 1. Number of deaths (and percentage) due to cerebrovascular disease subtypes (10th revision of the international classification of diseases) in São Paulo city, 1997-2003, according to gender and age-strata.

Cause (10-ICD)	30-39	40-49	50-59	60-69	70-79	30-79
Male	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Ill-defined stroke (I64)	68 (11,1)	305 (17,1)	784 (26.3)	1450 (35.5)	2052 (41.0)	4659 (32.2)
Intracerebral hemorrhage (I61)	292 (47.7)	841 (47.2)	1111 (37.2)	943(23.1)	737 (14.7)	3924 (27.1)
Cerebral infarction (I63)	74 (12.1)	228 (12.8)	513 (17.2)	851 (20.8)	1066 (21.3)	2732 (18.9)
Late-effects of cerebrovascular diseases (I69)	10 (1.6)	68 (3.8)	209 (7.0)	565 (13.8)	927 (18.5)	1779 (12.3)
Subarachnoid hemorrhage (I60)	143 (23.4)	295 (16.6)	295 (9.9)	192 (4.7)	86 (1.7)	1011 (7.0)
Other cerebrovascular diseases (I67)	12 (2.0)	30 (1.7)	55 (1.8)	67 (1.6)	90 (1.8)	254 (1.8)
Other non-trauma-related cerebral hemorrhage (I62)	13 (2.1)	13 (0.7)	18 (0.6)	17 (0.4)	42 (0.8)	103 (0.7)
Total	612 (100)	1780 (100)	2985 (100)	4085 (100)	5000 (100)	14462 (100)
Female	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Ill-defined stroke (I64)	62 (9.1)	283 (15.7)	505 (23.1)	1077 (35.7)	2030 (40.2)	3957 (31.1)
Intracerebral hemorrhage (I61)	238 (35.0)	665 (37.0)	751 (34.3)	690 (22.9)	759 (15.0)	3103 (24.4)
Cerebral infarction (I63)	71 (10.4)	167 (9.3)	277 (12.7)	547 (18.1)	1118 (22.1)	2180 (17.1)
Subarachnoid hemorrhage (I60)	269 (39.6)	581 (32.3)	470 (21.5)	313 (10.4)	231 (4.6)	1864 (14.6)
Late-effects of cerebrovascular diseases(I69)	11 (1.6)	33 (1.8)	94 (4.3)	288 (9.6)	793 (15.7)	1219 (9.6)
Other cerebrovascular diseases (I67)	28 (4.1)	65 (3.6)	81 (3.7)	87 (2.9)	101 (2.0)	362 (2.8)
Other non-trauma-related cerebral hemorrhage (I62)	1 (0.1)	5 (0.3)	11 (0.5)	12 (0.4)	16 (0.3)	45 (0.4)
Total	680 (100)	1799 (100)	2189 (100)	3014 (100)	5048 (100)	12730(100)

Table 2. Mortality rates (100,000 inhabitants) of stroke subtypes in São Paulo city, 1997-2003.

Male	30-39	40-49	50-59	60-69	70-79	Total
Ill-defined stroke (I64)	1.2	6.9	28.8	89.2	235.8	30.5
Intracerebral hemorrhage (I61)	5.1	19.2	40.8	58.0	84.7	25.7
Cerebral infarction (I63)	1.3	5.2	18.8	52.4	122.5	17.9
Late-effects of cerebrovascular diseases (I69)	0.2	1.5	7.7	34.8	106.5	11.6
Subarachnoid hemorrhage (I60)	2.5	6.7	10.8	11.8	9.9	6.6
Other cerebrovascular diseases (I67)	0.2	0.7	2.0	4.1	10.3	1.7
Other non-trauma-related cerebral hemorrhage (I62)	0.2	0.3	0.7	1.0	4.8	0.7
Female						
Ill-defined stroke (I64)	1.0	5.6	15.5	50.0	151.5	21.9
Intracerebral hemorrhage (I61)	3.8	13.1	23.0	32.0	56.6	17.2
Cerebral infarction (I63)	1.1	3.3	8.5	25.4	83.4	12.1
Subarachnoid hemorrhage (I60)	4.3	11.4	14.4	14.5	17.2	10.3
Late-effects of cerebrovascular diseases (I69)	0.2	0.7	2.9	13.4	59.2	6.8
Other cerebrovascular diseases (I67)	0.5	1.3	2.5	4.0	7.5	2.0
Other non-trauma-related cerebral hemorrhage (I62)	0.0	0.1	0.3	0.6	1.2	0.2

tality rates considering both types of hemorrhagic stroke (intracerebral and subarachnoid). The ratio between ischemic/hemorrhagic was 0.59 for men and 0.56 for women.

DISCUSSION

The description of stroke mortality in the city of São Paulo showed that the most common presentation of stroke death certification is still ill-defined

stroke, independent of the new criteria introduced by the Tenth Revision of the International Classification of the Diseases. However, there is a predominance of cases due to intracerebral hemorrhage, specially among deaths occurring at middle-age.

As stated by Lawlor et. al.[5], although stroke and coronary heart disease have the same risk factors, there is a difference in geographic, gender, race and age distribution over time. In a seminal paper, they described the secular trends of stroke subtypes (cerebral infarction and both types of hemorrhagic strokes) in England and Wales including mortality data and information about autopsy series. The ratio of ischemic to hemorrhagic stroke observed in 1999 for men and women aged 35-74 years was 0.38 in contrast to 0.56-0.59 observed in our study[5]

Mortality studies did not represent the only source of data to verify the distribution of stroke subtypes. In England and Wales, morbidity studies from hospital series and stroke register, revealed a ratio ischemic/hemorrhagic different from mortality data, i.e., almost 2.0.[5] In the city of São Paulo, an accurate *post-hoc* analysis of hospitalization due to stroke in a community school hospital during the 1990s disclosed that the ratio ischemic/hemorrhagic among patients admitted from the emergency ward was 2.1 similar to observed in the British study.[6] Other series described in Joinville, Santa Catarina showed a higher ratio (2.8) between ischemic and hemorrhagic.[7]

In Brazil, two autopsy studies, one from the city of São Paulo in the late 1990's, observed that among autopsied cases, the ratio ischemic/hemorrhagic was close to 0.40, a similar value observed during the 1940s in England.[8] Other series during the late 1980's, from Porto Alegre, showed a higher ratio, almost 0.7, i.e., with a preponderance of hemorrhagic stroke deaths[9].

Mortality studies using death certifications are an inexpensive, easy and standardized way to understand stroke epidemiology. However, there is always doubts about the quality of the data specifically for CVD. The World Health Organization sponsored MONICA (Monitoring of Trends and Determinants in Cardiovascular Disease) study revealed that ten of the previous 21 centers enrolled to create a stroke register were unable to maintain the quality of clinical data[10] However, the city of São Paulo has a good system of mortality data, permitting to verify the presence of data inconsistencies and to correct it before data consolidation. Previous studies of validation showed a quality similar to cities in United Kingdom and the United States[11].

However, for observational and clinical trials, other ways to classify stroke subtypes are more accurate as the "Trial of Org 10172 in Acute Stroke Treatment" (TOAST)[12] and the Oxfordshire Community Stroke Project[13]. These criteria are have been created combining clinical, radiographic and angiographic data. Therefore, the use of ICD-10 is an useful tool only for epidemiologic and public health purposes.

Concluding, mortality data classified according to the 10th Revision of International Classification of Diseases showed us the different pattern of stroke subtypes mortality according to gender and age. Hemorrhagic stroke is still an important component of cerebrovascular mortality in the city of São Paulo, Brazil. Compared to the Ninth Revision of the International Classification of Diseases, the Tenth one simplifies data analysis.

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