Original Article

Cardiovascular Diseases in the Elderly. Analysis of the Behavior of Mortality in a Municipality in the Southern Region of Brazil from 1979 to 1998

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Objective

To know the behavior of mortality due to cardiovascular diseases in the elderly living in the municipality of Maringá, in the Brazilian state of Paraná.

Methods

The causes of death over 20 years were studied according to sex, age, and groupings of the International Classification of Diseases, 9th and 10th Revisions, using the mortality database of the Ministry of Health.

Results

In regard to total deaths in the elderly, the proportional mortality due to cerebrovascular disease and ischemic heart disease decreased 42.5% and 34.4%, respectively, while that due to hypertension increased 119%, increasing from 2.1% to 4.6%. A 51.2%, 44.6%, and 12.5% decrease occurred, respectively, in the risk of death due to cerebrovascular disease, ischemic heart disease, and other forms of heart disease. For cerebrovascular disease and ischemic heart disease, the decrease in the estimate of the risk of death was greater among women, while for the other forms of heart disease, the decrease was greater among men. In regard to age groups, the risk of death increases as age advances for each cardiovascular disease in both sexes.

Conclusion

Cardiovascular diseases continue to play an important role in morbidity and mortality in the elderly population, requiring even greater effort from health care providers for their prevention and treatment.

Key words

cardiovascular diseases, elderly, mortality

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The absolute and relative increase in the population over the age of 60 years is a worldwide phenomenon. According to the 2000 census, the elderly in Brazil comprised 14,546,029 people, representing a 35.6% increase compared with the number in 1991. The estimates point towards the possibility that in the next 20 years the elderly will exceed 30 million in Brazil, accounting for approximately 13% of the population. The drop in the fertility rate is still the major cause of the reduction in the number of children, but the increase in life expectancy has progressively contributed to the increase in the elderly population [1]. Therefore, it is necessary to know the health status of this part of the population, and one of the most valuable sources of data is represented by mortality statistics, which also constitute the most traditional and one of the most effective methods for assessing the health status of populations [2].

The analyses of the causes of death of people aged > 65 years have shown that, in the United States, heart diseases, cancer, and cerebrovascular disease are the major causes of death, accounting for 41.6%, 20.7%, and 8.7%, respectively [3]. According to Beaglehole [4], ischemic heart disease is the major cause of death in industrialized countries, accounting for 30% of all deaths each year.

In Brazil, the reduction in mortality due to infectious and parasitic diseases between 1930 and 1985 was 471%, while cardiovascular diseases and neoplasias increased 208% and 322%, respectively, in the same period [5]. In the 1980s, the coefficient of mortality due to cardiovascular diseases increased 13.3%, and, in the first years of the 1990s, those diseases were the first cause of death, accounting approximately for 34% of the deaths in the country [6].

Description or knowledge of the health status of the population, even when indirectly assessed through data on mortality, is important, because it may propitiate the generation of causal hypotheses, in addition to contributing to the development of health programs and policies, specifically in this study, for the elderly population.

Maringá is a medium-sized municipality in the northwest of the state of Paraná. It has 288,653 inhabitants [1], and it, as well as other places, has experienced an increase in its elderly population. In 1960, the elderly were 3.5% of the total population, and, in 1996, this percentage reached 7.9% [7,8]. Therefore, the health characteristics of the population needed to be known. This study provided such information by analyzing the behavior of mortality due to cardiovascular diseases for the population aged 60 years or more in the municipality of Maringá.

Methods

Deaths from 1979 to 1998 of residents of Maringá aged 60 years or more were analyzed and grouped into 4 triennia. Data on death were obtained from the System of Information on Mortality of the Ministry of Health, which compiles information from death certificates in the CD-ROM format [9]. The death certificates are completed by physicians and encoded by a team from the Sector of Epidemiology of the Municipal Secretariat of Health. The basic causes of death were analyzed according to sex and age and were studied according to groupings of the International Classification of Diseases, 9th and 10th Revisions (ICD-9 and ICD-10) [10,11]. The causes of death studied were as follows: cerebrovascular disease (ICD-9: 430.0 - 438.9; ICD-10: I60.0 - I69.9), ischemic heart disease (ICD-9: 410.0 – 414.9; ICD-10: I20.0 – I25.9), other forms of heart disease (such as cardiomyopathies and heart failure) (ICD-9: 420.0 – 429.9; ICD-10: I30.0 – I52.9) and hypertension (ICD-9: 401.0 – 405.9; ICD-10: I10.0 – I15.9). The data on population were obtained from the statistical yearly publication of the Brazilian Institute of Geography and Statistics [8,12,13], and, for the years between the census, data estimated by the Nucleus of Population Studies of the UNICAMP were used [14].

Results

The analysis of mortality in the elderly residents of Maringá showed that the most frequent known causes in decreasing order of importance in that age group were as follows: diseases of the circulatory system, neoplasias, and diseases of the respiratory system. However, some changes were observed, among which a 23.6% drop in the relative weight of the diseases of the circulatory system stands out; these, however, remain the major cause of death among the elderly.

In the first triennium, cerebrovascular disease accounted for 24% of the deaths, but with a 42.5% drop, it declined to 13.8% in the last triennium, remaining the major cause of death in the elderly population of Maringá. A significant change in mortality regarding sex occurred as follows: in the beginning of the period, the relative participation was greater for women (26.2%) as compared with that for men (22.3%); at the end, however, as a more significant decrease occurred in the mortality of women, the mortality of men became slightly greater than that of women (14.2% versus 13.3%, respectively). In regard to coefficients, a greater decrease was observed for women (57.8%) than for men (44%) (tab. I).

Figure 1 offers a more detailed analysis according to sex and age, showing an increasing trend in the risk of death due to cerebrovascular disease as age advances, which was similar in both sexes and in the 2 extreme triennia. The drop in the rates for men aged 60 to 64 years and over 85 years was only 2.2% and 5.1%, respectively; on the other hand, for the other age groups, this difference ranged from 48.8% for men aged 80 to 84 years to 61.6% for those aged 75 to 79 years (tab. II). In the entire period, the risk of death due to cerebrovascular disease was greater for men, except for those over the age of 80 years in the first triennium, and those aged 75 to 79 years in the last triennium (fig. 2).

Ischemic heart disease continues to be the second cause of death among the elderly. It accounts for, at the end of the period, 10.2% and 11.2% of all deaths among men and women, respectively. However, a 34.4% decrease was observed in the mortality coefficient, which decreased from 739.2 to 409.8 deaths for each 100,000 inhabitants, greater for the female population (48.8%) than the male population (39.7%) (tab. I).

In regard to age, the mortality coefficients for men decreased, except for the age group of 65 to 69 years; on the other hand, for women, a decrease was observed in all age groups (fig. 1). The most significant decreases in the mortality coefficient occurred among the most elderly in both sexes (tab. II).

The proportional mortality due to other forms of heart disease increased 3.3%, increasing from 9.2% to 9.5% of the deaths in the elderly (tab. I), a behavior that differed between the sexes. For the male sex, a 10.6% drop was observed, and, for the female sex, a 15.7% increase was observed, suggesting migration from one diagnosis to the other. The estimate of the risk of death decreased in both sexes, more intensely in the male sex (21% versus 3.5% in the female) (tab. I). Figure 2 shows, in the last triennium, more linear curves with similar coefficients for men and women in all age groups, and, as for the other causes, the risk of death increases as age advances.

The proportional mortality due to hypertension increased 119%, and the coefficient increased 87.8% (tab. I); these variations occurred in both sexes, being more significant in the female sex. Until 1992, proportional mortality was similar between the sexes, but, due to the more significant increase observed in the female sex (160% versus 91% in the male sex), the difference increased, and hypertension is currently more frequent in deaths of elderly women (5.2% versus 4.2% in men) (tab. I). Figure 1 shows a mild tendency towards an increase in the estimate of the risk of death due to hypertension with age, from 70 years and above for men, and from 80 years and above for women.

Discussion

In all countries, the diseases of the circulatory system are a set of affections with diverse etiologies and clinical manifestations, playing an important role in the structure of morbidity and mortality [15]. Data on mortality in Brazil show that, in 1994, excluding the ill-defined causes, cerebrovascular disease accounted for 11.3% of all deaths, while ischemic heart diseases accounted for 9.3%. Of the diseases of the circulatory system, cerebrovascular disease contributed with 33.9%, while ischemic heart diseases contributed with 28% [16].

Considering mortality in the general population, ischemic heart diseases have assumed a greater importance, replacing cerebrovascular disease. According to Lessa et al [17], a tendency towards inversion exists in the causes of death, with cerebrovascular disease decreasing in importance, as occurred in Brazil in regions and capitals with better social and economic situations (south and southeast).

Lotufo [18] concludes that the transition in mortality trends for the state of São Paulo was more accelerated than that for the rest of the country, with ischemic heart diseases predominating over cerebrovascular disease, which, according to the author, results both from urbanization and adoption of western lifestyles, and also the ethnic composition of the population of the state of São Paulo.

Table I - Proportional mortality and coefficients of mortality in the elderly (per 100,000 inhabitants) due to diseases of the circulatory system, according to diagnosis and sex, in each triennium

Male

	1979-1981		1984-1986		1990-1992		1996-1998		Difference (%) 1979/81 - 1996/98	
Diagnoses	%	coef	%	coef	%	coef	%	coef	%	coef
Cerebrovascular	22.3	1169.1	19.1	929.1	21.3	1031.9	14.2	654.8	-36.3	-44.0
Ischemic	14.9	779.4	15.0	729.2	8.0	387.0	10.2	470.0	-31.5	-39.7
Other forms of heart disease	8.5	443.2	4.0	194.0	8.7	421.4	7.6	350.1	-10.6	-21.0
Hypertension	2.2	114.6	3.5	170.5	3.3	159.1	4.2	191.3	90.9	66.9
Other	3.4	175.7	3.4	164.6	3.2	154.8	3.6	165.3	5.9	- 5.9
Total	51.2	2682.1	44.9	2187.5	44.5	2154.2	39.8	1831.5	-22.3	-31.7

Female

	1979-1981		1984-1986		1990-1992		1996-1998		Difference (%) 1979/81 - 1996/98	
Diagnoses	%	coef	%	coef	%	coef	%	coef	%	coef
Cerebrovascular	26.2	1008.0	19.7	669.0	17.6	592.3	13.3	424.9	-49.2	-57.8
Ischemic	18.2	699.6	15.8	536.3	11.7	393.6	11.2	358.3	-38.5	-48.8
Other forms of heart disease	10.2	391.2	8.3	282.0	10.8	363.0	11.8	377.7	15.7	-3.5
Hypertension	2.0	75.2	3.4	116.1	3.4	114.6	5.2	166.6	160.0	121.5
Other	4.1	158.0	3.4	116.1	3.4	146.6	3.7	119.4	-9.8	-24.4
Total	60.5	2332.1	50.7	1719.5	46.9	1578.3	45.3	1446.9	-25.1	-38.0

Total

	1979-1981		1984-1986		1990-1992		1996-1998		Difference (%) 1979/81 - 1996/98	
Diagnoses	%	coef	%	coef	%	coef	%	coef	%	coef
Cerebrovascular	24.0	1087.9	19.3	795.0	19.7	799.2	13.8	531.0	-42.5	-51.2
Ischemic	16.3	739.2	15.3	629.8	9.6	390.5	10.7	409.8	-34.4	-44.6
Other forms of heart disease	9.2	417.0	5.8	239.4	9.6	390.5	9.5	365.0	3.3	-12.5
Hypertension	2.1	94.8	3.5	142.5	3.3	135.6	4.6	178.0	119.0	87.8
Other	3.7	166.8	3.4	139.6	3.3	133.5	3.7	140.6	-	-15.7
Total	55.2	2505.7	47.4	1946.3	45.5	1849.3	42.3	1624.4	-23.4	-35.2

*Percentage calculated in regard to the total of deaths in the elderly in each sex

In the municipality of Botucatu, also in the state of São Paulo, this phenomenon in mortality was also observed in the elderly population. In 1970, the proportional mortality for cerebrovascular and ischemic diseases was 22.58% and 17.97%, respectively, and, in 1993, it was 10.47% and 14.48%, respectively [19].

In the municipality of Maringá, this inversion process may be beginning with a drop in the difference or approximation in the relative values and in the coefficients of mortality due to cerebrovascular and ischemic heart diseases. In fact, although at the end of the period, proportional mortality due to cerebrovascular disease is still greater than that due to ischemic heart disease (13.8% versus 10.7%), the difference between them, from the first to the last triennium, decreased from 7.7 to 3.1 percentage points (tab. I).

Uemura and Pisa [20], in a study carried out from 1950 to 1985, reported that, in several countries, a consistent decrease in mortality due to cerebrovascular disease had been observed since the beginning of the 1950s, occurring faster in the second half of the period. The relative decrease in mortality rates was greater than 50% in Japan (67%), Australia (55%), the United States (55%), and Israel (52%) for men, and greater than 60% for women in Japan (66%) and Malta (68%).

In the United States, the results of the Minnesota Heart Survey showed that, from 1960 to 1990, the coefficients for mortality due to cerebrovascular disease dropped more than 50%, while the mean blood pressure in the population also decreased, and the antihypertensive treatment increased from 1973 to 1987 [21].

Lotufo [18] reported that, in the State of São Paulo from 1970 to 1989, the rates for cerebrovascular disease did not change in the younger, but showed a significant decrease for those aged > 60 years, in both sexes. That author also reported that the decrease observed was smaller than that in other countries, being in an intermediate situation with that in eastern European countries. That author attributed the lack of improvement in the mortality coefficients in the younger to the greater prevalence of subarachnoid hemorrhage in that age group with a greater lethality due to less preventable genetic determinants. Understanding the decline at ages > 60 years found in the study is not an easy task, because it involves a series of facts ranging from the lack of information on the type of the stroke causing death, to changes in the quality of filling out the death certificate, control of hypertension, and improvement in the medical care to patients [18].

The discussions about the causes that have directly contributed to the drop in mortality due to cerebrovascular disease involve other factors, such as the importance of antihypertensive treatment, which has increased, at least in the communities where studies accompanying these variables are conducted. Strokes of the hemorrhagic type are always more severe, and, according to Lessa [22], arterial hypertension, which is untreated, noncontrolled, or even unknown to the patient, is present in 100% of these cases.

However, one of the conclusions of the Minnesota Heart Survey reported that the antihypertensive treatment had a small effect on the decline in mortality rates due to cerebrovascular disease, because the use of medications only partially explains the decline

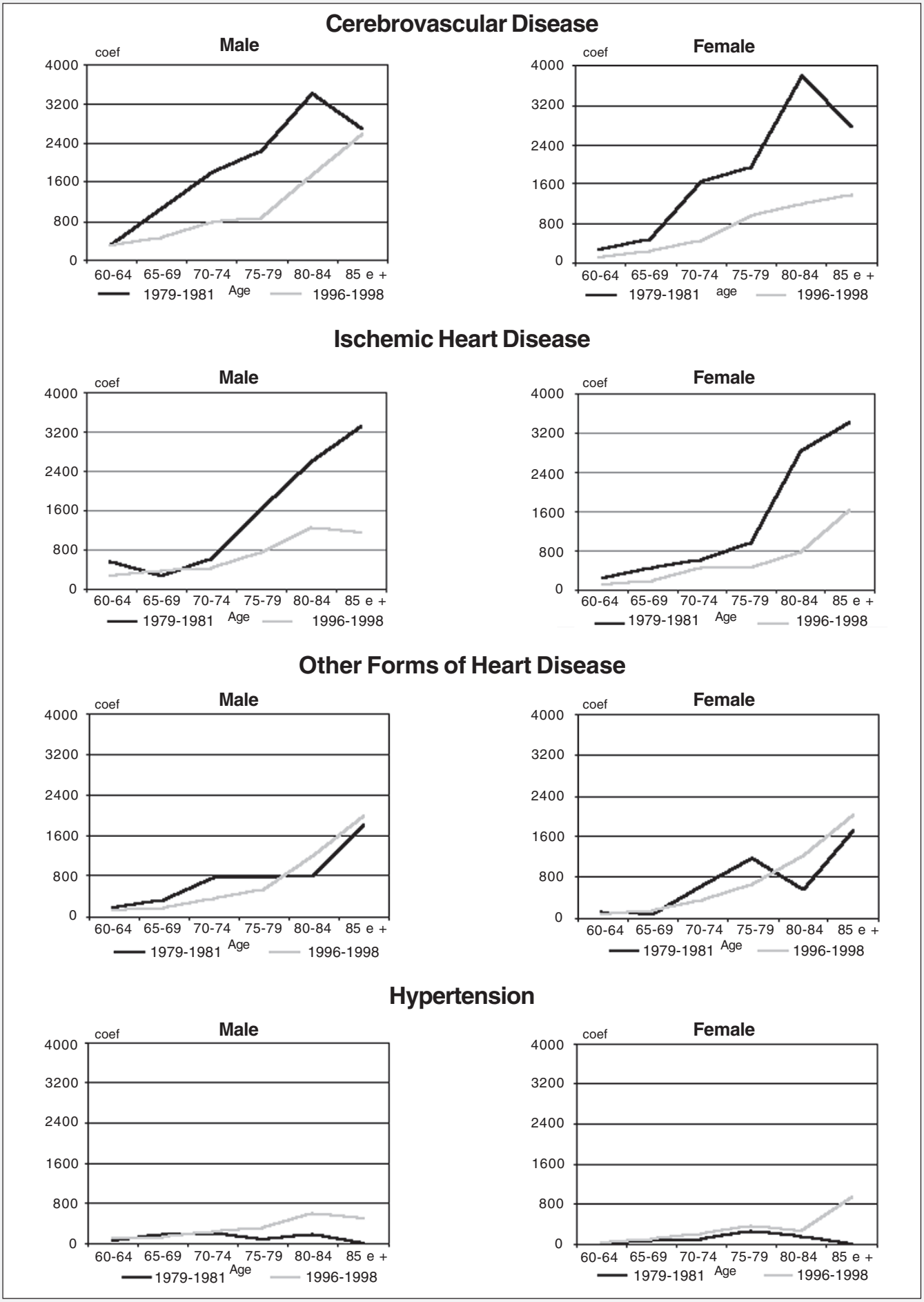

Fig. 1 – Coefficients of mortality in the elderly (per 100,000 inhabitants) due to cardiovascular diseases, according to sex and age group, in each triennium.

Table II – Coefficients of mortality due to diseases of the circulatory system in the elderly (per 100,000 inhabitants) in each triennium according to age and sex

Age	1979-1981 M	1979-1981 F	1979-1981 T	1996-1998 M	1996-1998 F	1996-1998 T	Diferença (%) 1979/81 - 1996/98 M	Diferença (%) 1979/81 - 1996/98 F	Diferença (%) 1979/81 - 1996/98 T
Cerebrovascular disease									
60 - 64	311.1	245.4	280.5	3043.3	93.1	192.6	-2.2	-62.1	-31.4
65 - 69	1047.1	476.2	740.4	448.2	220.7	327.9	-57.2	-53.7	-55.7
70 - 74	1819.9	1638.6	1727.0	784.2	456.8	607.8	-56.9	-72.1	-64.8
75 - 79	2246.4	1944.4	2096.9	862.6	960.3	915.4	-61.6	-50.6	-56.3
80 - 84	3409.1	3786.8	3611.7	1745.8	1208.2	1435.5	-48.8	-68.1	-60.2
85 e +	2702.7	2760.1	2736.3	2564.1	1375.6	1834.9	-5.1	-50.2	-32.9
Total	1169.1	1008.0	1087.9	654.8	424.9	531.0	-44.0	-57.8	-51.2
Ischemic heart disease									
60 - 64	563.9	245.4	415.6	256.8	127.0	188.1	-54.5	-48.2	-54.7
65 - 69	261.8	451.1	363.5	389.2	199.7	289.0	48.7	-55.7	-20.5
70 - 74	622.6	637.2	637.2	445.8	472.1	460.0	-28.4	-25.9	-27.8
75 - 79	1633.8	972.2	1306.3	743.6	454.9	587.5	-54.5	-53.2	-55.0
80 - 84	2597.4	2805.2	2708.8	1254.8	765.2	973.1	-51.7	-72.7	-64.1
85 e +	3303.3	3397.0	3358.2	1139.6	1614.8	1431.2	-65.5	-52.5	-57.4
Total	779.4	699.6	739.2	470.0	358.3	409.8	-39.7	-48.8	-44.6
Other forms of heart disease									
60 - 64	175.0	133.9	155.8	123.6	76.2	98.5	-29.4	-43.1	-36.8
65 - 69	320.0	75.2	188.5	165.1	147.2	155.6	-48.4	96.7	-17.4
70 - 74	766.3	637.2	700.1	356.6	350.2	353.2	-53.5	-45.0	-49.6
75 - 79	748.8	1180.6	962.5	535.4	657.1	601.2	-28.5	-44.3	-37.5
80 - 84	811.7	561.0	677.2	1200.2	1208.2	1204.8	47.9	115.4	77.9
85 e +	1801.8	1698.5	1741.3	1994.3	2033.5	2018.3	10.7	19.7	15.9
Total	443.2	391.2	417.0	350.1	377.7	365.0	-21.0	-3.5	-12.5
Hypertension									
60 - 64	58.3	-	31.2	85.6	16.9	49.3	46.7	-	58.1
65 - 69	174.5	75.2	121.2	129.7	94.6	11.2	-25.7	25.8	-8.3
70 - 74	191.6	91.0	140.0	214.0	198.0	205.3	11.7	117.5	46.6
75 - 79	68.1	277.8	171.9	327.2	353.8	341.6	380.6	27.4	98.7
80 - 84	162.3	140.3	150.5	600.1	241.6	393.9	269.7	72.3	161.7
85 e +	-	-	-	474.8	956.9	770.6	-	-	-
Total	114.6	75.2	94.8	191.3	166.6	178.0	66.9	121.5	87.8

in the mean blood pressure of the population [23]. The potential of the antihypertensive treatment has not yet been reached in the community studied, because between 3 and 10 hypertensive individuals continue without treatment, and, in addition, the time interval between the first diagnosis and the beginning of treatment may still be reduced, improving the relation between blood pressure levels and mortality due to stroke [23]. In addition, the causes of drops in the mean blood pressure observed in a population level, even considering the increase in antihypertensive treatment, remained unclear. The increase in physical activity, better weight control, and drop in alcohol and salt consumption are relevant factors that deserve to be studied.

Evidence exists that the prevalence of smoking has decreased since 1964 in the United States [23], and this may have directly influenced the decline in mortality rates. In addition, as smoking has also been related to educational level, it is important to explore the relation of socioeconomic level and mortality due to stroke [23]. Another result reported by the Minnesota Heart Survey is the drop in the mean serum levels of total cholesterol in the population between 1973 and 1987, which may be related, even if to a minor extent, to the reduction in mortality due to thromboembolic strokes.

Another possibility is that the reduction in mortality due to heart diseases in recent decades may have indirectly contributed to the decline in mortality due to cerebrovascular disease. According to Wolf [24] and Benjamin et al [25], atrial fibrillation, myocardial infarction, and the reduction in left ventricular function may generate heart thrombosis, resulting in stroke. Lotufo [18] states that,

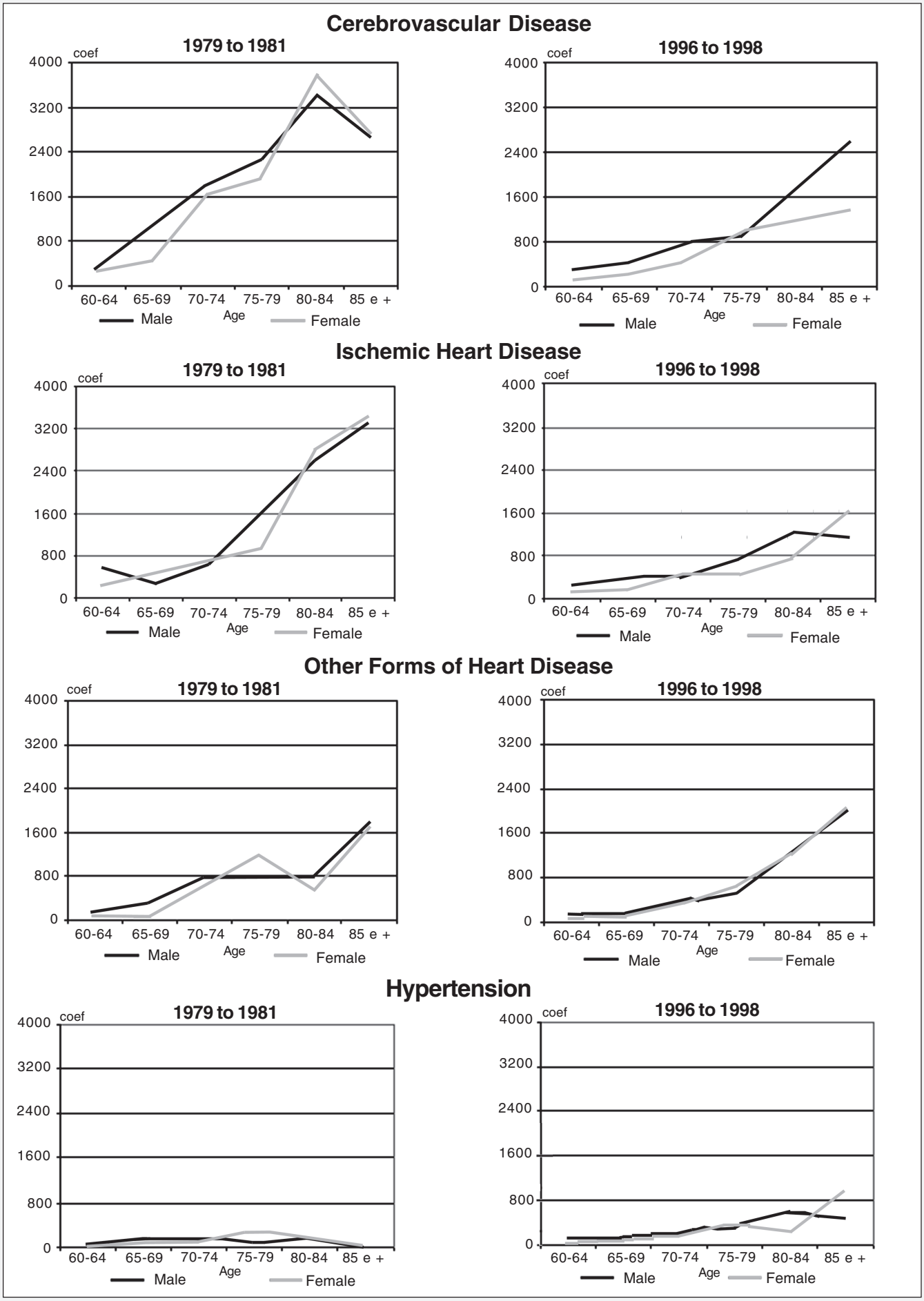

Fig. 2 – Coefficients of mortality in the elderly (per 100,000 inhabitants) due to cerebrovascular disease, according to sex and age group, in each triennium.

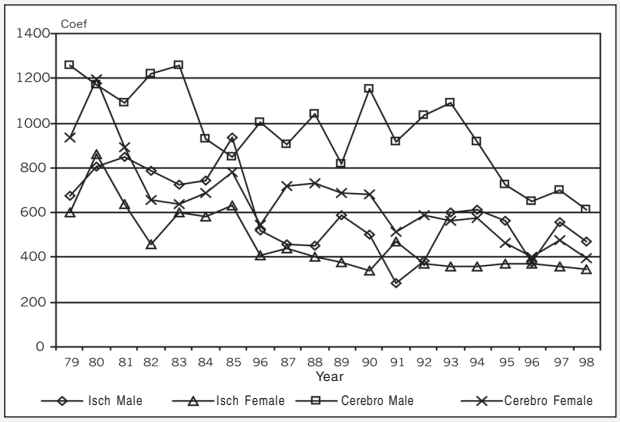

Fig. 3 – Coefficients of mortality in the elderly (per 100,000 inhabitants) due to cerebrovascular and ischemic heart disease according to sex and year.

although this impact should be better assessed, the use of antiplatelet agents, such as acetylsalicylic acid, after transient cerebral ischemic episodes became popular among physicians as primary prevention, also influencing the natural history of cerebrovascular disease.

All these factors may be extrapolated to the population residing in Maringá, if the treatment trends, diagnostic techniques, and medical managements progressively incorporated into the health services are considered.

In all Brazilian regions, ischemic heart disease is an important cause of death with persistent high rates, despite the decline that has been observed in some metropolitan area capitals [26]. A decline in mortality has been observed from the age of 20 years onwards in the municipality of São Paulo between 1976 and 1983 [27], for the elderly population of Botucatu between 1970 and 1993 [19], and in the municipality of Goiânia between 1980 and 1994 [28].

In Maringá, the coefficients of mortality due to ischemic heart disease in the last triennium studied showed greater values for men, except for the ages 70 to 74 years and 85 years or more, whose risk was greater for females (472.1 versus 445.8 deaths per 100,000 inhabitants aged 70 to 74 years, and 1614.8 versus 1139.6 deaths per 100,000 inhabitants aged 85 years or more) (tab. II).

In Brazil, the difference between men and women with coronary heart disease is one of the smallest. Lotufo [26] states that this fact results from the high mortality rates among women and not from the reduced rates among men. This statement confirms the conclusion about the myths regarding cardiovascular diseases according to Laurenti and Buchalla [29], who reported that clinical and epidemiological studies clearly showed that ischemic heart disease is not fundamentally a disease of men, but it also affects women significantly. The false belief that this group of diseases affects mainly men may also have led women to underestimate some specific symptoms, preventing an early diagnosis from being made.

For Simons [30], the drop in mortality due to ischemic heart disease in the younger seems to be attributed more to a reduction in the incidence of the disease then to a reduction in the number of fatal cases. For the elderly, according to the author, the explanation may lie in the improvement of serum cholesterol levels, dietary habits, and smoking habit. In addition, the report of the results of studies on risk factors for ischemic heart disease, such as the Framingham study, is believed to have influenced the change in lifestyle of the population and therapeutic interventions by the health services leading to a reduction in mortality due to that cause [31].

Studies have shown that in the United States, between 1968 and 1976, 60% of the decline in mortality was attributed to changes in lifestyle, mainly the reduction in serum cholesterol levels and smoking cessation, and 40% of the decline was attributed to specific medical intervention [32].

No studies on the natural history of ischemic heart disease and of the prevalence of risk factors exist, specifically for the elderly population in Brazil. However, one may think that the same factors, such as the drop in serum cholesterol levels, and, mainly, the improvement in medical care to the infarcted patient, may be extrapolated to the population of Maringá, resulting in a clear reduction in the risk of death over the 20 years studied.

Although the risk of death due to cardiovascular diseases has decreased, a distinct behavior has been observed in regard to mortality trends reported for a more recent period. A study developed by Lotufo [33] raised an important discussion about mortality due to cardiovascular diseases, mainly ischemic heart disease. The author reported results on mortality in adults aged from 40 to 79 years living in Brazilian metropolitan areas from 1979 to 1998. While the mortality rate due to cerebrovascular diseases has been declining, the mortality rate due to ischemic diseases seems to have reached a limit from which no trend towards a decline has been evidenced. This trend has also been observed for the municipality of Maringá, in which a decline in mortality due to cerebrovascular disease occurred, even in the 1990s. This decline, however, was not observed for mortality due to ischemic heart disease, which, from 1992 onwards, showed a stationary trend, mainly among women (fig. 3). Lotufo [33] reported that, parallel to the decline in mortality due to cardiovascular disease in Brazil, other studies have shown an important increase in the prevalence of obesity. According to Monteiro et al [34], obesity in the Brazilian population (body mass index ≥ 30 kg/m^2) increased from 2.4% to 6.9% for men and from 7% to 12.5% for women from 1973 to 1996, and this may lead to an increase in the prevalence of diabetes, which, in the United States, increased from 4.9% in 1990 to 6.5% in 1998 [35].

For the other forms of heart disease, the results found in Maringá, with a more important drop in the age group from 75 to 79 years and an increase in the age group of 80 years and over for females, were similar to those reported by Sutherland et al [36]. These authors, in a study on proportional mortality in the United States between 1950 and 1986, found a reduction in the percentage of deaths due to ischemic heart disease and an increase in the deaths due to other forms of heart disease, mainly in the age group of 85 years and over.

Arterial hypertension, if considered in isolation, is the most frequent disease in the adult population in the entire industrialized world and in developing countries, mainly in urban areas [22].

According to Lessa [22], no study exists enabling the inference about the prevalence of arterial hypertension in Brazil, because the existing ones do not portray the characteristics of the population, because the macroregions are socially and economically extremely heterogeneous with significant inequalities in several health indicators. That author, however, states that the prevalence of arterial hypertension is elevated, many times between 20 and 30%, after analyzing the existing studies for the Brazilian regions.

When analyzed as a cause of death, arterial hypertension is not as important as it was in the past, due to the recognition of its association with most cardiovascular diseases, which are prioritized in codification [22]. In the United States, for example, the participation of hypertension in the total of deaths is only 3% [37]. For Brazil, in 1979, this participation was 2.39% of the people > 15 years of age [38], and, in 1988, it was 2.8% [22].

For the elderly population of Maringá, one of the possibilities for the increase in proportional mortality and in the coefficients of mortality due to hypertension could be the adoption of the 10th Revision of the ICD [11] for codifying the causes of death, initiated in 1996 in the municipality. However, observations relative to the intermediate triennium (not presented in this study) showed that these modifications had already occurred in the 1990-1992 triennium, a period still under the 9th Revision of the ICD [10].

As the literature has pointed to a constant decrease in these indicators in recent decades [18,38], the behavior of mortality due to hypertension may not be homogeneous for all population groups. According to Laurenti [38], mortality due to hypertension increases with age, reaching, in the population aged 65 to 74 years, 100 or more times that in the population aged 25 to 34 years. Therefore, the trend towards an increase in the indicators of mortality found in Maringá may reflect particular characteristics of the population studied, considering that in the analysis of the trends in mortality due cardiovascular diseases, it is important to assess whether the changes observed in a certain cause may be explained by changes in another due to variations in the use of diagnoses [39].

The conclusions about the trend observed in the municipality of Maringá should be analyzed examining also the magnitude of the changes studied, considering that the chronic diseases in the elderly interact among themselves in a complex manner. An important finding in this study was the increase in the risk of death due to hypertension, mainly in women (tab. I). The decline in mortality due to both cerebrovascular diseases and ischemic heart disease and other forms of heart disease could be partly attributed to the migration of diagnoses to hypertension. Still, the improvement in medical care and greater availability of diagnostic technology may have resulted in a more complete knowledge about each disease, with the possibility of a safer diagnosis. Because the uniformity of the diagnostic practices and of the filling out of death certificates in the 2 decades studied is not guaranteed, influence may somehow exist in the changes observed, both for arterial hypertension and the other causes of death.

It is worth noting that the decrease in mortality due to cardiovascular diseases found in other places and in the elderly population living in Maringá does not necessarily reflect the smaller prevalence of these aggravating elements in the population, mainly if this reduction is adapted to treatment and not prevention of new cases.

Nevertheless, the drop in mortality due to diseases should be considered a great achievement and the increase in survival of the elderly population should be recognized and spread, and efforts should be intensified to improve even more this reality. It is important that health care providers be prepared, considering that they are co-responsible for complications and deaths, which are sometimes early, resulting from the quality of the health care provided for cardiovascular diseases [40].

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