Epidemiologic Transition in Mortality Rate from Circulatory Diseases in Brazil

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Summary

Background: Circulatory diseases (CD) are the major cause of death in Brazil, being cerebrovascular diseases (CVD) predominant. In developed countries ischemic heart diseases (IHD) predominate.

Objective: The objective of the present study was to investigate the ratio between cerebrovascular diseases/ischemic heart diseases (CVD/IHD) in males and females who were 30 years of age and older.

Methods: Population estimates and mortality data for CD, IHD and CVD were provided by the Ministry of Health for the period between 1980 and 2005. The risk of death from IHD and CVD per 100,000 Brazilians and CVD/IHD ratio were analyzed in 10-year age ranges as of 30 years of age. The risk of death was adjusted by direct method by using 1960 world population as the standard population.

Results: It was observed that the risk of death from IHD and CVD increased exponentially as age advanced. CVD was the major cause of death in Brazil until 1996, when IHD took the lead. In the period between 1980 and 2005 a 33.25% reduction in death risk from CD was observed in the Brazilian population. In that same period, the metropolitan area of the capital city of São Paulo reported a 45.44% reduction. The CVD/IHD ratio was shown to be higher among younger women – from 2.53 in 1980 down to 2.04 in 2005 in the Brazilian population, and from 2.76 in 1980 down to 1.96 in the metropolitan area of the capital city of São Paulo, with decreasing figures for subsequent age ranges. Among males, the CVD/IHD ratio was close to < 1 in all age ranges.

Conclusion: A transition in death risk from CD could be observed in Brazil, with current predominance of IHD. (Arq Bras Cardiol 2009; 93(5) : 468-472)

Key words: Brain ischemia; myocardial ischemia; mortality; urban population; São Paulo; Brazil.

Introduction

Circulatory diseases (CD) are the major cause of death in Brazil. As of 1980 a reduction in mortality rate from those conditions has been observed[1]. Such reduction was shown to be higher in the Southeastern and Southern parts of the country – the most developed areas – and in the age range over 60[2]. From all CD the ischemic heart diseases (IHD) and the cerebrovascular diseases (CVD) stand out. The IHD are the major cause of death in developed countries, whereas CVD are major causes of death in developing countries such as Eastern European countries[3]. In Brazil, mortality rate from circulatory diseases is higher in males. Males have reported a similar risk of death both from IHD and CVD. Females have shown to have higher death rate from CVD as compared to IHD. However, in the most developed areas in Brazil females have shown mortality rate to be higher from IHD[4]. The objectives in the present study were to investigate the trend for the risk of death from CD, IHD and CVD in the Brazilian population as a whole, and in the capital city of São Paulo metropolitan area, as well as IHD/CVD ratio.

Methods

Mortality rate from CD was investigated in the Brazilian population (a developing country) and in the capital city of São Paulo metropolitan area. São Paulo metropolitan area was chosen as the representative of a developed country since it is one of the most developed areas in Brazil. Population estimates and mortality data for CD, IHD and CVD were provided by the Ministry of Health for the period between 1980 and 2005. Population estimates were obtained from censuses taken in 1980, 1991 and 2000, from the 1996 count and inter-census projections from 1985 through to 2005. For the period between 1980 and 1995 deaths were classified following ICD-9, 9th Conference on the International Classification of Diseases (1975), and adopted by the 20th World Health General Meeting. CDs are grouped under codes 390 to 459; IHDs under codes 410 to 414; and CVDs under codes 430

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to 438 in ICD-9 for the Brazilian population the the period between 1979 and 1995. Mortality rate in the period between 1996 and 2005 was classified by ICD-10 (ICD 10th Revision). CDs are grouped under codes I10 to I82.9; IHDs under codes I20 to I25; and CVDs under codes I60 to I69. Mortality data per 1000,000 Brazilians were analyzed in the general population, both in males and females, aged 30 and older. It was subsequently calculated every 5 years - between 1980 and 2005 – the ratio between CVD and IHD both in males and females at 10-year ranges from 30 years of age on. The risk of death was adjusted by direct method by using 1960[5] world population as the standard population.

Results

The trend for the risk of death from CD, IHD and CVD both in males and females in the Brazilian population and in São Paulo metropolitan area for the period between 1980 and 2005 can be found in Table 1. From 1980 through to 2005 Brazil was shown to report significant reduction of mortality from CD (-33.25%), CD in males (-32.37%), CD in females (-34.46%), IHD among males (-31.32%), IHD among women (-29.23%), CVD among males (-33.38%) and CVD among females (-38.30%). In the period between 1980 and 2005 the capital city of São Paulo metropolitan area showed significant reduction of mortality rate from CD (-45.44%), CD among males (-41.65%), CD among females (-51.40%), IHD among males (-39.49%), IHD among females (-46.59%), CVD among males (-44.96%) and CVD among females (-56.75%). The analysis of the 10-year age ranges as of 30 years of age showed significant mortality rate reduction from CVD and IHD both in Brazil as a whole and in the São Paulo metropolitan area. In Brazil, mortality rate reduction from CVD ranged from 25.65% to 59.65%; and from IHD, the range was from 14.22% to 48.29%. In the São Paulo metropolitan area mortality rate reduction from CVD ranged from 16.65% to 69.84%; and from IHD, the range was from 12.01% to 54.07% (Table 2). CVD/IHD ratio was higher in younger age ranges. Ratio has always been reported > 1 for Brazilian females. Gradual reduction could be seen as age advanced in the period beween 1980

Table 1 - Risk of death from circulatory diseases (CD) , ischemic heart diseases (IHD) and cerebrovascular diseases (CVD) per 100,000 Brazilian individuals, and the range from year 1 to final year both in Brazil and in the São Paulo metropolitan area - 1980-2005

	Brazil							São Paulo						
Year	CD	CD-Males	CD-Females	IHD-Males	IHD-Females	CVD-Males	CVD-Females	CD	CD-Males	CD-Females	IHD-Males	IHD-Females	CVD-Males	CVD-Females
1980	730.40	422.95	307.45	208.56	129.94	214.39	177.51	1082.56	661.70	420.86	399.72	221.56	261.98	199.30
1981	714.34	413.66	300.68	203.53	127.85	210.13	172.83	1018.50	618.34	400.15	376.12	212.21	242.22	187.95
1982	687.32	405.12	282.20	199.15	117.88	205.97	164.32	977.44	602.56	374.88	367.72	200.76	234.84	174.12
1983	698.84	411.55	287.28	204.39	123.75	207.17	163.54	989.98	606.55	383.43	370.18	207.07	236.36	176.36
1984	705.65	417.01	288.64	205.19	120.72	211.82	167.92	956.36	590.06	366.30	361.36	197.95	228.70	168.34
1985	699.41	415.59	283.82	205.59	121.17	209.99	162.65	962.20	602.80	359.40	363.49	196.07	239.32	163.32
1986	677.24	401.91	275.34	197.20	117.66	204.71	157.68	904.56	565.59	338.97	339.40	187.29	226.18	151.68
1987	662.35	392.53	269.82	197.40	117.16	195.13	152.66	887.69	547.88	339.81	343.23	190.44	204.65	149.37
19-88	682.85	406.23	276.62	203.61	119.79	202.61	156.83	919.11	568.07	351.03	348.12	190.09	219.96	160.94
1989	652.37	388.48	263.89	191.37	114.55	197.11	149.34	870.01	540.56	329.45	332.57	182.73	207.99	146.72
1990	637.53	379.97	257.56	186.30	110.24	193.68	147.32	857.67	536.89	320.78	329.06	176.90	207.83	143.88
1991	603.25	360.55	242.71	178.26	105.79	182.29	136.91	803.84	498.45	305.39	311.22	169.06	187.23	136.33
1992	591.79	354.12	237.67	172.24	100.92	181.89	136.74	799.53	503.17	296.36	314.68	164.25	188.50	132.11
1993	630.60	376.21	254.39	181.54	106.74	194.67	147.65	825.53	512.42	313.12	322.54	172.63	189.87	140.49
1994	622.01	369.51	252.50	179.47	106.90	190.04	145.60	810.85	503.45	307.40	314.81	171.28	188.64	136.13
1995	613.05	361.12	251.93	177.41	109.82	183.71	142.10	814.78	506.68	308.10	316.11	171.55	190.56	136.55
1996	561.87	333.67	228.20	170.36	102.15	163.30	126.06	835.15	531.12	304.04	333.30	172.23	197.81	131.80
1997	559.16	332.26	226.90	167.88	101.27	164.37	125.63	822.06	514.35	307.72	320.98	171.97	193.37	135.75
1998	564.28	336.69	227.59	170.25	102.39	166.44	125.20	795.39	499.30	296.09	314.40	165.08	184.91	131.01
1999	562.48	334.59	227.88	170.85	102.70	163.74	125.19	823.55	522.45	301.10	328.09	168.72	194.36	132.38
2000	503.74	303.59	200.14	156.86	90.21	146.73	109.93	703.17	446.21	256.96	288.28	146.63	157.93	110.34
2001	505.18	304.79	200.39	156.41	90.33	148.39	110.06	674.65	424.06	250.59	272.19	145.12	151.87	105.47
2002	507.18	304.40	202.78	157.35	92.18	147.06	110.59	675.16	424.82	250.34	273.54	142.39	151.28	107.95
2003	513.11	310.15	202.97	160.97	92.29	149.18	110.67	658.74	419.43	239.30	276.00	137.55	143.44	101.75
2004	522.21	313.89	208.32	164.05	95.51	149.84	112.81	668.82	424.44	244.38	273.77	137.62	150.67	106.76
2005	487.54	286.05	201.49	143.23	91.96	142.82	109.53	590.60	386.08	204.52	241.88	118.33	144.20	86.19
%V	-33.25	-32.37	-34.46	-31.32	-29.23	-33.38	-38.30	-45.44	-41.65	-51.40	-39.49	-46.59	-44.96	-56.75

Table 2 - Risk of death from circulatory diseases (CD), ischemic heart diseases (IHD) and cerebrovascular diseases (CVD) per 10-year age ranges, and the range from year 1 to final year both in Brazil and in the São Paulo metropolitan area - 1980-2005

Brazil – Cerebrovascular Diseases								São Paulo – Cerebrovascular Diseases						
Age range	1980	1985	1990	1995	2000	2005	% Variação	1980	1985	1990	1995	2000	2005	% Variação
30-39 fem	4.63	4.50	3.92	3.60	2.58	1.93	-58.19	5.12	5.39	4.48	3.79	3.20	2.38	-53.56
30-39 males	5.16	5.72	4.44	3.75	2.61	2.11	-59.22	6.81	7.67	5.89	4.77	3.09	2.05	-69.84
40-49 fem	13.39	13.62	11.47	11.55	9.16	7.98	-40.42	16.52	14.15	12.59	12.22	9.33	8.30	-49.77
40-49 males	16.47	17.33	14.80	13.76	10.02	8.34	-49.39	20.72	21.44	17.08	16.81	12.13	9.97	-51.87
50-59 fem	21.92	22.60	20.17	18.95	14.75	13.62	-37.88	24.47	21.84	19.01	18.00	15.53	11.73	-52.07
50-59 males	30.77	33.08	30.51	26.57	21.72	19.35	-37.12	36.15	38.48	30.50	29.54	22.35	19.74	-45.41
60-69 fem	41.55	36.93	34.32	32.71	25.96	24.29	-41.55	43.39	36.16	31.77	31.10	23.63	36.16	-16.65
60-69 males	56.83	56.86	52.55	50.85	41.23	37.94	-33.24	65.59	62.33	52.70	47.91	43.72	36.97	-43.63
70-79 fem	51.52	46.31	41.44	38.70	29.56	29.54	-42.65	55.50	45.58	39.75	34.86	27.06	24.89	-55.16
70-79 males	60.13	58.65	54.38	51.18	42.06	41.62	-30.79	76.64	63.42	59.67	50.79	41.69	38.18	-50.18
≥80 fem	44.50	38.67	35.99	36.60	27.93	32.17	-27.71	53.31	50.06	38.10	36.56	31.15	30.33	-43.12
≥80 males	45.02	41.54	36.99	37.60	29.09	33.47	-25.65	56.08	45.97	41.99	40.75	34.94	32.39	-42.24
Brazil – Ischemic Heart Diseases								**São Paulo - Ischemic Heart Diseases**						
Age range	1980	1985	1990	1995	2000	2005	% Variação	1980	1985	1990	1995	2000	2005	% Variação
30-39 fem	1.83	1.79	1.46	1.52	1.22	0.95	-48.16	1.75	1.92	1.99	1.69	1.81	1.00	-42.98
30-39 males	4.56	4.54	4.04	3.66	2.90	2.36	-48.29	5.40	4.94	5.81	5.07	4.74	2.95	-45.35
40-49 fem	6.65	6.27	6.04	6.66	5.73	5.21	-21.55	8.75	6.50	7.68	7.98	7.90	5.67	-35.19
40-49 males	18.33	16.94	15.90	15.56	13.60	12.14	-33.75	30.21	24.72	27.58	24.12	21.35	14.87	-50.80
50-59 fem	14.49	14.58	13.89	14.24	11.83	12.43	-14.22	18.65	19.79	18.57	21.06	17.50	15.58	-16.46
50-59 males	36.62	37.41	35.07	32.37	29.13	29.23	-20.19	64.23	59.12	56.49	53.88	48.91	40.38	-37.14
60-69 fem	32.27	30.25	28.51	29.06	25.27	24.48	-24.14	51.44	45.26	42.92	42.90	38.78	45.26	-12.01
60-69 males	60.07	58.85	56.69	53.85	50.12	48.04	-20.03	108.19	102.25	95.11	91.03	91.22	72.05	-33.41
70-79 fem	39.25	35.45	31.41	31.04	25.73	25.78	-34.32	70.55	55.06	48.64	45.08	41.98	32.40	-54.07
70-79 males	52.44	51.60	45.57	43.89	39.50	40.74	-22.31	114.14	98.46	84.53	85.65	72.07	63.00	-44.80
≥80 fem	35.45	34.82	28.94	27.31	20.42	22.06	-37.78	70.77	68.12	57.98	51.59	40.03	38.36	-45.80
≥80 males	36.54	35.65	29.74	27.30	21.66	25.22	-30.96	77.53	74.00	59.54	56.35	49.99	48.64	-37.26

and 2005. Among males, the ratio was close to 1 for all age ranges at all times. (Table 3) Among São Paulo metropolitan area females CVD/IHD ratio was shown to be > 1 in the younger age ranges, although < 1 as of 1990 for the 50-59-year-old range (Table 3).

Discussion

The present study has shown significant mortality rate reduction from CD in the São Paulo metropolitan area. CVD was the major cause of death amon females in the Brazilian population, whereas mortality rate from IHD showed to be predominant among men in general and among women in the São Paulo metropolitan area. Mortality distibution from CVD and IHD in Brazil was similar to that observed in most developing countries with CVD playing a major role, whereas in the São Paulo metropolitan area IHD predominated, similarly to what could be observed in most developed countries[6,7]. In the US, IHDs were responsible for 52% of deaths in 2004, whereas CVD accounted for 17%. In developing countries, however, it was observed that CVD[8] plays a key role. Such result mirrors risk factors control inadequacy for CD, particularly HTN. HTN is known to be the most prevalent risk factor in the Brazilian population and in the less favored population classes[9]. Social and economic conditions and the resulting poorer access to health care exposes those individuals to higher risk of death from CVD[10]. André et al[11] have observed a > 50% reduction in the mortality rate from CVD in the period between 1980 and 2002 in most of Brazil regions, except for the Northeastern region, where reduction was lower (41%). Such reduction was comparable to those observed in countries such as the US and Canada, and may have been the result of better public health policies[11]. Despite that reduction, the awareness for signs and symptoms as well the treatment of CVDs are limited among our population, although getting better among individuals with higher schooling[12]. Such change mirrors an epidemiologic transition of mortality rate from cardiovascular diseases that was observed in Brazil in the 1990's. The present study has shown that males reported higher mortality rate from CVD, although as of 1996, IHD started predominating in Brazil. Females, in their turn, have always reported CVD as the major cause of death. Since Brazil exhibits quite a heterogeneous picture for the risk of death from circulatory diseases in the different regions[2], the São Paulo metropolitan area was chosen as representative of the most developed area in the country from the social and economic point of view. Mortality rate from IHD in the city has always been higher as compared to CVD – a similar pattern to that observed in more developed countries. That result may be due to wider population access – although still limited – to the control of the major risk factor for CVD - HTN. Mortality rate data from the Ministry of Health data base present problems such as errors in diagnosis, death certificate innacuracies, a number of deaths with from unknown causes, and data entering errors. No validation studies for mortality rate data are available in most states and cities in this country. However, an indirect indicator of data quality standard is the number of death certificates containing diagnosis for the cause of death such as symptoms, signs and poorly defined health affections – still significant in most Brazilian towns and cities in the Northeastern, Northern, and Central-Western regions, although not significant in the Southern and Southeastern regions. The diagnosis is not significant for the São Paulo metropolitan area either.

Conclusion

The present study had the objective to show the epidemiologic transition of mortality rate from CDs in Brazil in the last decade, with current predominance of IHDs. The causes of such changes are not clear.

Table 3 - Ratio – cerebrovascular and ischemic heart diseases per 10-year age ranges as of 30 years of age in Brazil and in the São Paulo metropolitan area - 1980-2005

	Brazil						São Paulo					
Age range	1980	1985	1990	1995	2000	2005	1980	1985	1990	1995	2000	2005
30-39 fem	2.5	2.5	2.7	2.4	2.1	2.0	2.9	2.8	2.3	2.2	1.8	2.4
30-39 males	1.1	1.3	1.1	1.0	0.9	0.9	1.3	1.6	1.0	0.9	0.7	0.7
40-49 fem	2.0	2.2	1.9	1.7	1.6	1.5	1.9	2.2	1.6	1.5	1.2	1.5
40-49 males	0.9	1.0	0.9	0.9	0.7	0.7	0.7	0.9	0.6	0.7	0.6	0.7
50-59 fem	1.5	1.6	1.5	1.3	1.2	1.1	1.3	1.1	1.0	0.9	0.9	0.8
50-59 males	0.8	0.9	0.9	0.8	0.7	0.7	0.6	0.7	0.5	0.5	0.5	0.5
60-69 fem	1.3	1.2	1.2	1.1	1.0	1.0	0.8	0.8	0.7	0.7	0.6	0.8
60-69 males	0.9	1.0	0.9	0.9	0.8	0.8	0.6	0.6	0.6	0.5	0.5	0.5
70-79 fem	1.3	1.3	1.3	1.2	1.1	1.1	0.8	0.8	0.8	0.8	0.6	0.8
70-79 males	1.1	1.1	1.2	1.2	1.1	1.0	0.7	0.6	0.7	0.6	0.6	0.6
≥80 fem	1.3	1.1	1.2	1.3	1.4	1.5	0.8	0.7	0.7	0.7	0.8	0.8
≥80 males	1.2	1.2	1.2	1.4	1.3	1.3	0.7	0.6	0.7	0.7	0.7	0.7

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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