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Mesothelioma Mortality Rate in Brazil, 1980 to 2010

Mortalidade por Mesotelioma no Brasil, 1980 a 2010

Mortalidad por Mesotelioma en Brasil, 1980 a 2010

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Abstract

Introduction: Mesothelioma is a type of cancer whose incidence has been increasing worldwide, mainly as a result of asbestos exposure. Brazil is still a major producer and consumer of that fiber. **Objective:** The aim of this paper is to describe the distribution of mesothelioma mortality rate in Brazil during the period of 1980-2010. **Method:** An ecologic study was carried out with a descriptive analysis. The records used came from the National System of Information on Mortality of DataSUS (Sistema Nacional de Informações sobre Mortalidade do DataSUS). **Results:** Found 3,718 deaths from mesothelioma; the majority of them (2,180) occurred in the Southeast of the country. There was a balance in the mortality rate between men and women showing a ratio of 1.12:1, and 80.7% of deaths occurred among individuals within the age range of 50 years old and above. The standardized mortality rates by age increased from 0.64 deaths per million population in 1980 to 1.18 deaths per million population in 2002. **Conclusion:** Mortality statistics for mesothelioma in Brazil are low; they don't match the intensity of production and use of asbestos in our country; and they don't reflect the actual magnitude of the problem.

Key words: Mesothelioma/epidemology; Asbestos/poisoning; Neoplasms, Environmental Health Surveillance, Brazil

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INTRODUCTION

Mesothelioma is a type of cancer that used to be considered rare, but now has been gaining global visibility due to its increasing incidence worldwide[1]. It reaches especially the pleura (the main causal agent of over 80% of the cases is the exposure to asbestos fibers[2]).

This disease is considered an occupational cancer because approximately 80-85% of the cases are attributable to the exposure to fibers in the workplace[2], but also to environmental exposure, which occurs mainly in areas close to mining activity, industries, buildings and products that release the fiber by its natural wear, and also due to domestic exposure through clothing or objects brought home by workers who handle the material[3,4].

Mesothelioma has a long latency period that may range between 15 and 60 years[5] and its diagnosis is difficult to determine, being necessary to collect histological, immunohistochemical and cytogenetic information for the differential diagnosis with other tumors, including adenocarcinomas and sarcomas[1,6-8]. The survival period after diagnosis corresponds to about 12 months[9].

Asbestos have been used intermittently for thousands of years due to its physical properties that confer commercial importance and participation in an increasingly wide range of industrial products, like tiles, water tanks, joints and automotive brake pads[2]. The world consumption of this fiber has greatly increased from the 1920s, reached its peak in 1980 and declined by the end of 1990, stabilizing at about 2 million metric tons per year, approximately half of which accounts for the peak consumption in the 1980s[10,11].

Due to its recognized carcinogenic potential at any dose inhaled[2], from the end of the 80s, about 58 countries – including all European Community – have begun to prohibit the chrysotile fiber type, whereas the amphibole fiber type is already banned worldwide[12]. For such countries, the incidence and mortality rates in the future are expected to stabilize. At the same time, the production and consumption of the fiber has shifted to less industrialized countries of peripheral economy, where data on the disease are scarce, the exposure is generally high, and mortality rates can reach peak into the future[13]. Brazil is the 3rd largest producer, consumer and exporter of asbestos; but, despite this, the scarce incidence and mortality statistics show values much lower than expected[14].

The aim of this paper is to describe the distribution of mesothelioma mortality rate in Brazil during the period of 1980-2010.

METHOD

Mortality data was obtained from the Mortality Information System (SIM, in Portuguese), provided by DataSUS in the website www.datasus.gov.br. From 1980 to 1995, deaths were selected primarily because they corresponded to code 163 (Malignant neoplasm of pleura) of the 9th revision of the International Classification of Diseases (ICD- 9). During the period of 1996-2010, selected deaths had underlying cause codes corresponding to the 10th revision of the International Classification of Diseases (ICD - 10): C45.0 (malignant pleural mesothelioma); C45.1 (malignant mesothelioma of the peritoneum); C45.2 (malignant mesothelioma of the pericardium); C45.7 (malignant mesothelioma from other locations); C45.9 (mesothelioma unspecified) and C38.4 (cancer of the pleura, excluding mesothelioma). It was assumed that all deaths linked to the cancer of pleura corresponded to mesotheliomas[15]. There was also collected information on the following variables: date of death, date of birth, age at death, place of residence and gender. The corresponding population data for the denominators was also obtained in DataSUS and was based on censuses (1980, 1991, 2000 and 2010), Count (1996) and intercensal projections (other years), according to age, gender and household situation, elaborated by the Brazilian Institute of Geography and Statistics (IBGE, in Portuguese).

For descriptive analysis, the absolute and relative frequencies (percentages) of deaths were calculated on the selected code and place of residence in macro-regional Federation Units and Capitals levels of aggregation. Then, the top 12 were selected in each group according the average rate and their attributes of gender, age and year of death. The average rates were obtained by a sum of the deaths during the determined time period in relation to the sum of the territory's population during the same period, including deaths and populations for which the age attribute was ignored. Five-year average rates were obtained by the sum of deaths accumulated during 5 years in relation to the sum of the population equally accumulated for the periods of 80-84, 85-89, 90-94, 95-99, 00-04. For that, we used every year with available data on the SIM, and the last period (05-10) was a six-year period, and, thus, used a calculation with the accumulation of 6 years, including deaths and populations for which the age group attribute was ignored. Gross annual rates were estimated and age-standardized by the world population provided by the World Health Organization (WHO), reported by 106 people. For this calculation, we didn't considered deaths and population for which the ignored age group was assigned. Tabulations and calculations were performed using the Tabwin 3.4® and Excel 2013®.

RESULTS

From 1980 to 2010, 3,718 mesothelioma deaths occurred in Brazil, being 1,961 (52.74%) among men. Three deaths had no information about gender. The

majority of deaths were concentrated in individuals within the age range of 50 years old or above (80.7%), especially between 60 and 69 years old (24%) and 70 and 79 years old (25%) (Figure 1).

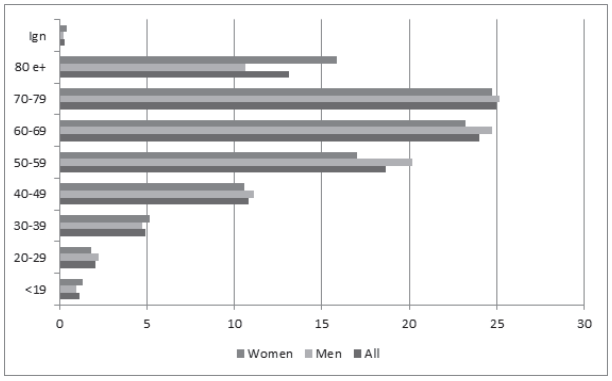

Figure 1. Distribution of deaths from mesothelioma by gender and age group, Brazil. 1980 to 2010
Source: Prepared by the author with data from the Mortality Information System (SIM), MINISTRY OF HEALTH Brazil, DataSUS.

In Figure 2, one can observe the upward trend in mortality from mesothelioma during the study period. During the initial period of the series, 296 deaths have occurred; and between the years of 2005-2010, 1,128 deaths have occurred ranging between 158 and 578 among men, and between 138 and 550 among women. The highest number of deaths was seen during the years of 1995-1999. The five-year mortality rates ranged between 0.48 and 1.00 deaths per million population (in general); between 0.51 and 1.04 deaths per million population among men; and between 0.44 and 0.96 deaths per million population among women, respectively during the first and the last period analyzed. The man: woman rate was 1.12:1 throughout the study period.

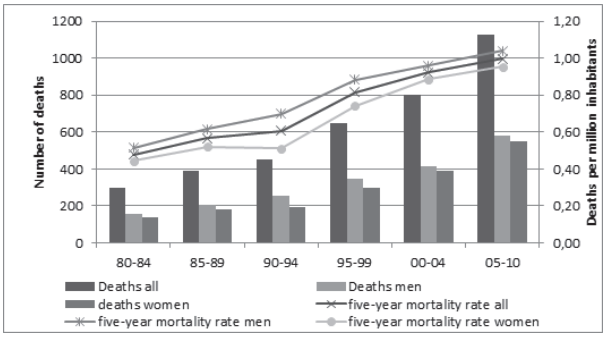

Figure 2. Distribution of deaths and five-year average mortality rates by gender for mesothelioma (per million inhabitants), Brazil, from 1980 to 2010
Source: Prepared by the author with data from the Mortality Information System (SIM), MINISTRY OF HEALTH Brazil, DataSUS.

Table 1 shows the distribution of the absolute number of deaths, the average rates (AR) and annual age-standardized mesothelioma mortality rate by age, in Brazil and its regions, States, and selected capitals, in descending order, beginning from the average mortality rate. It was seen that the annual standardized mortality rate by age in Brazil showed the minimum value of 0.64 deaths per million population in 1980 and 1985 and the maximum value of 1.18 per million population in 2002.

By analyzing the distribution of deaths according to the Brazilian regions, one can observe that 58% (2,180) of these occurred in the Southeastern region, followed by the Southern region with 17.5%, the Northeastern region with 16.6%, the Midwestern region with 4.4%, and the North of the country with 2.8%. The average mortality rates in the Southeast (1.05) and South (0.89) of the country were higher than the national average rate of 0.77 deaths per million population. These regions had also the highest annual mortality rates.

The deaths occurred in the states of São Paulo, Rio de Janeiro, Minas Gerais and Rio Grande do Sul represented, respectively, 30.7%, 15.5%, 11.2% and 10.2% of the total deaths from mesothelioma registered in the country during the study period. Together, they accounted for 67.6% of the total deaths. The referred states, as well as the Federal District, had higher rates than the average rates of Brazil. In Table 1, one can observe the importance of these states for the pattern of mortality rate from mesothelioma in the country.

In relation to the evaluated capitals, it's worth noting the concentration of deaths in São Paulo, Rio de Janeiro, Salvador and Porto Alegre, corresponding, respectively, to 27.11%, 22.9%, 6.7% and 5.8% of the total deaths. Together, these capitals accounted for 62.51% of deaths from mesothelioma occurred in the study period. Porto Alegre, Rio de Janeiro and Recife had the highest average mortality rates.

Table 2 shows the distribution of deaths from mesothelioma in the study period. It is observed that 1,238 (33.3%) occurred in the period of the validity of ICD-9 code and received 163 (malignant neoplasm of pleura). Already during the CID 10, one can observe that 40.5% of deaths received code C38.4 (Malignant neoplasm of pleura) and 26.3% received the code C45.X (Malignant Mesothelioma). Among the malignant mesotheliomas themselves (C45.X), 35.14% showed pleural location, 14.65% were located in the peritoneum, pericardium 0.72%, 6.46% in other locations, and 43.03% were classified as not specified. Although the order of distribution of deaths among men and women has shown the same order of distribution, it was possible to observe some specificity. The percentage of female peritoneum cancer was about 8% higher than that presented by the set of deaths and deaths in general, and about 14% higher than in men. The percentage of unspecified mesothelioma in men, in turn, was 10% higher than among women.

Table 1. Distribution of deaths. average rates (AR) and annual mortality rates from mesothelioma in Brazil. 1980- 2010

	Deaths	AR	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Brasil	3718	0.77	0.64	0.76	0.68	0.86	0.65	0.64	0.85	0.81	0.87	0.81	0.82	0.78	0.78	0.90	0.82	0.92	0.95	1.18	1.16	1.05	0.92	0.95	1.18	1.15	1.15	1.17	1.17	1.12	1.07	0.82	0.94
Regions																																	
Sudeste	2180	1.05	0.84	0.98	0.88	1.41	0.93	0.84	1.08	1.15	0.95	0.87	1.21	1.01	1.07	1.18	1.19	1.03	1.17	1.15	1.58	1.43	1.09	1.17	1.50	1.41	1.36	1.63	1.55	1.38	1.35	1.08	1.07
Sul	650	0.89	0.74	1.07	0.86	0.75	0.27	0.98	1.29	0.70	0.97	1.46	0.68	1.32	0.70	1.12	0.55	1.57	0.82	1.76	1.09	1.37	1.14	0.76	1.44	1.13	1.39	1.21	1.39	1.15	1.12	0.51	1.02
Centro-oeste	165	0.51	0.00	0.22	0.77	0.71	0.75	0.11	0.61	0.37	1.08	0.74	0.33	0.17	0.33	0.43	0.61	1.15	1.54	1.40	1.41	0.86	0.47	0.98	1.02	0.46	0.98	0.85	0.87	0.89	1.02	0.36	0.77
Nordeste	619	0.45	0.41	0.33	0.33	0.11	0.47	0.28	0.36	0.36	0.67	0.38	0.48	0.28	0.48	0.40	0.50	0.34	0.62	0.93	0.49	0.48	0.70	0.76	0.65	0.93	0.82	0.58	0.61	0.80	0.74	0.73	0.77
Norte	104	0.30	0.45	0.51	0.00	0.58	0.32	0.24	0.56	1.11	0.85	1.01	0.00	0.42	0.80	0.89	0.34	0.85	0.57	0.74	0.64	0.14	0.36	0.44	0.46	0.94	0.56	0.45	0.36	0.42	0.11	0.59	0.54
States																																	
Rio de Janeiro	575	1.37	1.37	1.48	0.65	1.48	0.94	0.89	2.13	1.52	1.12	1.15	1.66	1.57	1.59	1.74	1.80	1.78	1.03	1.79	1.83	2.42	1.25	0.93	1.67	1.90	1.55	1.59	1.28	1.23	1.08	1.03	0.98
Rio Grande do Sul	378	1.28	0.71	1.51	1.47	1.09	0.41	0.83	1.51	0.72	1.01	2.13	0.89	2.01	0.70	0.99	0.91	2.23	0.91	2.74	1.68	1.63	1.21	0.82	2.09	1.37	1.81	1.08	1.45	1.44	1.31	0.69	1.52
Distrito Federal	62	1.10	0.00	0.67	2.66	2.49	0.00	0.00	0.00	0.57	3.19	0.00	0.00	0.00	1.48	0.00	1.45	1.53	3.94	1.26	8.59	2.40	0.53	3.33	4.99	1.37	2.78	1.95	1.74	1.20	1.93	0.86	1.72
São Paulo	1142	1.09	0.81	0.97	1.17	1.48	0.99	0.99	1.05	1.19	0.99	0.82	1.25	0.80	0.91	0.92	1.03	0.69	1.37	0.97	1.71	1.37	1.21	1.36	1.39	1.38	1.59	1.84	1.89	1.60	1.78	1.29	1.13
Minas Gerais	412	0.80	0.47	0.41	0.66	1.32	0.72	0.61	0.26	0.78	0.77	0.79	0.60	1.04	1.03	1.19	1.06	1.17	1.05	1.02	1.15	0.69	0.78	0.99	1.68	1.11	0.76	1.30	1.25	1.05	0.87	0.76	0.92
Santa Catarina	114	0.75	0.40	0.92	0.99	0.93	0.00	0.85	1.24	0.35	0.41	0.36	1.04	0.00	0.98	1.29	0.64	1.88	0.76	0.55	1.13	1.99	1.58	1.12	0.64	0.59	1.74	1.90	2.23	0.72	0.77	0.41	0.79
Sergipe	31	0.62	0.00	0.00	0.00	1.40	1.46	1.33	0.00	0.85	0.00	0.00	0.95	0.00	1.25	0.00	0.00	0.93	2.00	3.35	1.12	1.72	2.42	0.00	0.00	0.68	0.00	0.00	0.67	1.56	0.77	0.39	1.50
Pernambuco	141	0.61	1.32	1.28	0.45	0.00	0.25	0.25	0.16	0.71	0.85	0.38	0.12	0.36	0.35	1.09	0.58	0.37	1.82	1.29	1.19	0.72	0.61	0.69	1.27	1.16	1.72	1.02	0.80	0.90	0.82	0.36	0.42
Espírito Santo	51	0.59	0.00	1.38	0.00	0.65	1.53	0.00	0.00	0.75	0.66	0.00	1.80	0.00	0.00	1.22	0.30	0.00	0.00	0.41	0.90	1.02	0.33	1.35	0.78	1.10	0.97	1.20	0.58	1.56	0.39	0.56	1.95
Paraná	158	0.57	0.98	0.53	0.00	0.19	0.23	1.30	1.04	0.83	1.23	1.08	0.19	1.06	0.54	1.22	0.00	0.44	0.70	1.07	0.31	0.67	0.80	0.45	1.05	1.11	0.61	0.97	0.82	1.04	1.09	0.36	0.51
Bahia	188	0.49	0.49	0.20	0.73	0.00	0.83	0.73	0.65	0.38	1.36	0.10	0.83	0.31	0.88	0.33	0.43	0.22	0.10	0.82	0.32	0.44	0.85	1.27	0.85	0.74	1.21	0.49	0.91	0.89	0.77	0.74	0.47
Mato Grosso do Sul	29	0.49	0.00	0.00	2.13	0.00	2.43	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.81	2.73	1.41	1.68	0.00	0.86	0.00	1.36	0.00	0.00	1.31	0.60	2.11	0.40	1.17	0.00	1.25
Capitals																																	
Porto Alegre	86	2.14	2.64	3.35	0.93	0.00	0.00	0.00	1.99	2.78	0.99	4.22	0.93	3.16	2.74	2.38	0.00	4.11	0.60	3.60	0.78	1.36	0.57	1.72	6.79	0.55	2.23	1.25	2.51	1.82	2.56	0.31	3.08
Rio de Janeiro	338	1.93	1.84	2.38	0.64	1.78	1.02	1.00	2.50	2.07	1.04	1.14	1.63	2.32	2.01	2.68	1.96	2.52	1.31	2.72	1.97	3.75	1.20	1.05	1.85	2.19	1.71	1.80	1.70	1.08	0.80	1.12	1.06
Recife	68	1.61	2.98	2.93	1.22	0.00	1.34	1.30	0.72	2.46	3.12	2.04	0.73	0.99	1.73	4.82	3.07	0.00	5.69	3.54	4.32	0.72	2.36	0.81	1.51	2.81	4.13	3.78	0.00	1.96	0.00	0.78	0.00
Salvador	99	1.44	3.11	0.00	2.06	0.00	4.35	2.51	2.34	0.00	3.74	0.85	4.86	2.48	4.04	1.31	1.70	0.93	0.77	4.64	1.41	2.06	3.82	3.46	3.49	0.98	3.91	0.68	0.54	1.99	1.18	1.95	0.66
Florianópolis	13	1.43	0.00	0.00	0.00	0.00	0.00	0.00	6.66	0.00	0.00	0.00	5.21	0.00	5.36	4.75	0.00	0.00	0.00	0.00	4.58	4.53	0.00	3.24	0.00	2.61	3.03	2.22	2.81	0.00	0.00	0.00	5.05
São Paulo	400	1.30	0.93	1.04	1.53	1.78	0.97	1.82	0.75	0.97	1.64	1.48	0.99	0.85	1.16	1.33	0.98	0.37	1.45	1.26	1.99	1.75	1.07	1.53	1.48	2.21	2.40	2.20	2.33	1.37	1.68	1.43	1.70
Maceió	28	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47	0.00	0.00	3.11	2.76	2.72	6.60	3.99	5.34	4.83	2.54	4.32	1.89	3.03	4.92	0.00	1.08	1.19	0.00	3.13	1.56	1.52
Aracaju	17	1.29	0.00	0.00	0.00	0.00	6.34	5.10	0.00	4.08	0.00	0.00	0.00	0.00	5.03	0.00	0.00	3.11	3.62	8.93	4.57	3.43	0.00	0.00	0.00	2.23	0.00	0.00	0.00	3.56	0.00	1.52	1.36
Belo Horizonte	77	1.18	0.00	1.23	1.82	2.49	0.77	1.70	0.00	0.41	1.27	1.98	0.00	1.35	2.00	1.56	0.68	2.50	0.35	2.86	2.90	1.54	0.79	0.60	3.09	1.46	1.52	1.49	1.82	1.69	1.68	0.59	0.65
Brasília	62	1.10	0.00	0.67	2.66	2.49	0.00	0.00	0.00	0.57	3.19	0.00	0.00	0.00	1.48	0.00	1.45	1.53	3.94	1.26	8.59	2.40	0.53	3.33	4.99	1.37	2.78	1.95	1.74	1.20	1.93	0.86	1.72
Belém	41	1.08	1.69	0.86	0.00	3.04	0.00	1.61	1.76	4.48	1.47	1.79	0.00	1.52	3.18	1.30	0.00	2.55	2.40	4.60	3.15	1.05	0.00	3.01	2.43	4.00	1.06	1.02	0.76	0.68	0.00	0.74	1.26
Campo Grande	19	1.07	0.00	0.00	9.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80	2.72	5.60	0.00	0.00	0.00	2.42	0.00	0.00	1.75	1.88	6.28	1.15	3.64	0.00	2.22

Source: Prepared by the author with data from the Mortality Information System (SIM), MINISTRY OF HEALTH Brazil, DataSUS.
AR : age-standardized (per million inhabitants). geographic regions and selected states and capitals.

Table 2. Distribution of deaths from pleural cancer and mesothelioma by gender, Brazil, 1980- 2010

Diagnosis	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
163 - Malignant neoplasm of pleura	50	62	55	71	58	58	80	80	87	83	85	84	88	100	94	103																1.238
C38.4 Pleura																	77	95	89	89	77	92	101	107	121	110	96	129	118	94	109	1.504
C45.0 Mesothelioma of the pleura																	11	25	18	15	22	14	33	21	18	32	30	21	28	23	32	343
C45.1 Mesothelioma of the peritoneum																	8	6	6	2	6	7	8	11	4	11	17	17	13	12	15	143
C45.2 Mesothelioma of the pericardium																	0	0	0	0	1	0	0	1	1	1	0	0	2	0	1	7
C45.7 Mesothelioma of other locati																	1	3	6	4	8	2	4	6	2	6	8	4	3	2	4	63
C45.9 Mesothelioma NE																	24	20	24	24	20	25	30	33	30	24	31	37	35	30	33	420
C45.X																	44	54	54	45	57	48	75	72	55	74	86	79	81	67	85	976
163+c45	50	62	55	71		58	80	80	87	83	85	84	88	100	94	103	44	54	54	45	57	48	75	72	55	74	86	79	81	67	85	2.156
163 + c384	50	62	55	71		58	80	80	87	83	85	84	88	100	94	103	77	95	89	89	77	92	101	107	121	110	96	129	118	94	109	2.684
163+c384+c45	50	62	55	71	58	58	80	80	87	83	85	84	88	100	94	103	121	149	143	134	134	140	176	179	176	184	182	208	199	161	194	3.718
Men																																
163 - Malignant neoplasm of pleura	23	38	32	33	32	30	46	45	44	43	47	53	48	54	55	52																675
C38.4 Pleura																	44	47	45	42	35	42	46	54	54	56	47	57	57	43	47	716
C45.0 Mesothelioma of the pleura																	4	14	14	6	16	9	23	12	10	20	19	11	21	12	18	209
C45.1 Mesothelioma of the peritoneum																	3	2	2	2	1	2	3	3	1	3	5	5	8	6	5	51
C45.2 Mesothelioma of the pericardium																	0	0	0	0	1	0	0	1	1	1	0	0	1	0	1	6
C45.7 Mesothelioma of other locati																	1	1	5	4	2	0	2	4	1	4	5	2	2	0	3	36
C45.9 Mesothelioma NE																	16	15	12	17	11	15	18	26	19	12	26	19	22	22	18	268
C45.X																	24	32	33	29	31	26	46	46	32	40	55	37	54	40	45	570
163+c45	23	38	32	33		30	46	45	44	43	47	53	48	54	55	52	24	32	33	29	31	26	46	46	32	40	55	37	54	40	45	1.213
163 + c384	23	38	32	33		30	46	45	44	43	47	53	48	54	55	52	44	47	45	42	35	42	46	54	54	56	47	57	57	43	47	1.359
163+c384+c45	23	38	32	33	32	30	46	45	44	43	47	53	48	54	55	52	68	79	78	71	66	68	92	100	86	96	102	94	111	83	92	1.961
Women																																
163 - Malignant neoplasm of pleura	27	24	23	38	26	28	34	35	43	40	38	31	39	46	39	50																561
C38.4 Pleura																	32	48	44	47	42	50	55	53	67	54	49	72	61	51	62	787
C45.0 Mesothelioma of the pleura																	7	11	4	9	6	5	10	9	8	12	11	10	7	11	14	134
C45.1 Mesothelioma of the peritoneum																	5	4	4	0	5	5	5	8	3	8	12	12	5	6	10	92
C45.2 Mesothelioma of the pericardium																	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
C45.7 Mesothelioma of other locati																	0	2	1	0	6	2	2	2	1	2	3	2	1	2	1	27
C45.9 Mesothelioma NE																	8	5	12	7	9	10	12	7	11	12	5	18	13	8	15	152
C45.X																	20	22	21	16	26	22	29	26	23	34	31	42	27	27	40	406
163+c384+c45	27	24	23	38		28	34	35	43	40	38	31	39	46	39	50	52	70	65	63	68	72	84	79	90	88	80	114	88	78	102	1.728
163 + c384	27	24	23	38		28	34	35	43	40	38	31	39	46	39	50	32	48	44	47	42	50	55	53	67	54	49	72	61	51	62	1.322
163+c384+c45	27	24	23	38	26	28	34	35	43	40	38	31	39	46	39	50	52	70	65	63	68	72	84	79	90	88	80	114	88	78	102	1.754

Source: Prepared by the author with data from the Mortality Information System (SIM), MINISTRY OF HEALTH Brazil, DataSUS.

163 - Malignant neoplasm of pleura (163.0 - The parietal pleura; 163.1 - The visceral pleura; 163.8 - Other; 163.9 - The pleura); C38.4 Pleura; C45.0 Mesothelioma of the pleura; C45.1 Mesothelioma of the peritoneum; C45.2 Mesothelioma of the pericardium; C45.7 Mesothelioma of Other locati; C45.9 Mesothelioma NE; C45.X- all malignant mesotheliomas.

DISCUSSION

Mortality rates from mesothelioma in Brazil during the study period are lower than other countries where asbestos exposure occurred. Thus, it is believed that there is a sub record of the disease in Brazil.

Delgermaa et al.[16] studied deaths from malignant mesothelioma related to 83 countries in the database of the WHO mortality rates between the years of 1994 and 2008, had a gross rate and a mortality rate adjusted for age of 6.2 and 4.9 deaths per million population, respectively. Considering the countries analyzed separately, the authors found that the UK had the highest mortality rate adjusted per age, namely 17.8 deaths per million, followed by Australia with 16.5 deaths per million, and Italy with 10.3 deaths per million.

Underreporting is a common problem when dealing with the case of rare diseases difficult to diagnose[16]. Park et al.[17] globally estimate a case of mesothelioma is neglected for four to five reported cases. Aguilar-Madrid et al.[18] found only 7 deaths with malignant pleural mesothelioma recorded as the underlying cause of death in a total of 24 cases of the disease in a case-control study. Lilienfeld et al.[19], in Minnesota, between the years of 1969 and 1971, estimated an underestimation of the number of cases in 4-8 times its actual occurrence, considering the erroneous coding of the disease on death certificates. Also Camidge et al.[20] reported the dispersion of cases of mesothelioma in a variety of other diagnostic analyzing data from Scotland. Pedra et al.[21] in a preliminary analysis of data from a study with 46 medical records of patients whose underlying cause of death was recorded as pleural cancer during the period of 1996 to 2006 identified an undercount of 13% of malignant mesothelioma.

Moreover, the high percentage of Unspecified malignant mesotheliomas (43,03%) is suggestive of huge limitations in the country to perform the proper diagnosis of this tumor. Another issue worth mentioning is the fact that malignant mesothelioma received only a specific code, namely the C45, in the 10th version of the ICD-10, which was implemented in Brazil in 1996. Many countries, however, have not implemented this new classification yet, still in effect for such the 9th version of the ICD, which does not include an encoding itself for malignant mesothelioma[7]. The use of different forms of disease classification hinders comparisons between countries.

Based on the results, it was seen that the distribution of deaths by age is consistent with the natural history of this long latency disease: the majority of deaths as well as rising rates of mortality occurred in groups of 50 years old or above. The same upward trend was verified by López-Abente et al.[15] in a study in Spain on mortality from pleural cancer, covering the period of 1976-2010, which also used the sum of codes 163 of ICD-9, C38.4 (Malignant neoplasm of pleura) and C45.0 (Malignant Mesothelioma of the pleura). However, unlike our study, the author noted a downward trend in the younger age groups. The high mortality rate in people younger than 49 years old was a finding not expected in our study.

In Italy, among the 15,845 cases analyzed from the National Registry of Mesotheliomas occurring between 1993 and 2008, it was found that the median time elapsed between exposure and diagnosis was of 46 years[5].

The Southeast and Southern regions were those that focused most mesothelioma mortality. In the study by Luna et al.[22], we saw that this same distribution applies to hospitalizations by disease and by expenses with patients because of the 4,264 hospital admissions between 1995 and 2007 - 43% and 29%, occurred in these regions, respectively. To the authors, this fact is directly related to the work process, as well as better access and encourages the health system and the health of workers in these regions, expressed by the greater presence and amount of specialized centers for the care worker health.

We notice that the Midwest region had a limited number of mesothelioma deaths in relation to the expected. This finding is probably underestimated, since the only asbestos mine in Brazil is currently functioning in Minaçu-Goiás.

Mortality from mesothelioma in women in Brazil can be considered low compared to that found in other countries. For example, the male: female ratio observed in this study corresponded to 1.12:1. Delgermaa et al.[16] observed the male: female of 3.6:1 in the UK and in Australia and Italy, this ratio was 5.7:1, 5.4:1, and 2.4:1, respectively.

Worldwide, the male: female ratio reflects occupational exposure to asbestos in men. However, in the case of Brazil, the similarity of the incidence and mortality between the genders suggests that both have environmental exposure to asbestos. It is also likely that there are many women occupationally exposed, but also that there is household exposure.

CONCLUSION

Mortality statistics by mesothelioma in Brazil for the analyzed period probably does not reflect the true magnitude of the problem. Accordingly, the shares of early identification of asbestos exposure, improvement of diagnostic techniques, training of professionals for the correct completion of death certificates and the surveillance of the tumor itself should be improved.

CONTRIBUTIONS

Francisco Pedra and Patricia de Oliveira da Silva participated in all the steps of the writing process for the paper, including data collection and consolidation. Inês E. Mattos and Hermano Castro were involved in literature revision and writing and in the critical appraisal of the paper.

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Resumo

Introdução: O mesotelioma é um câncer cuja incidência vem aumentando em todo o mundo como resultado, sobretudo, da exposição ao amianto. O Brasil ainda é um grande produtor e consumidor dessa fibra. **Objetivo:** O objetivo deste trabalho é descrever a distribuição da mortalidade por mesotelioma no Brasil no período de 1980 a 2010. **Método:** Foi realizado estudo descritivo ecológico, com análise descritiva dos dados. Utilizaram-se registros do Sistema Nacional de Informações sobre Mortalidade do DataSUS. **Resultados:** Foram encontrados 3.718 óbitos por mesotelioma; a maioria (2.180) ocorreu na região Sudeste. Houve um equilíbrio na mortalidade entre homens e mulheres mostrando uma razão de 1,12:1 e 80,7% das mortes atingiram a faixa etária de maiores de 50 anos. As taxas de mortalidade padronizadas por idade aumentaram de 0,64 óbitos por milhão de habitantes em 1980 a 1,18 óbitos por milhão de habitantes em 2002. **Conclusão:** As estatísticas de mortalidade por mesotelioma no Brasil são baixas, e não correspondem ao volume da produção e do uso do amianto em nosso país podendo não refletir a real magnitude da doença.

Palavras-chave: Mesotelioma/epidemiologia; Asbestos/envenenamento; Neoplasias; Vigilância Sanitária Ambiental; Brasil

Resumen

Introducción: El mesotelioma es un cáncer cuya incidencia está aumentando en todo el mundo, como resultado sobre todo a la exposición al asbesto. Brasil aún es un importante productor y consumidor de la fibra. **Objetivo:** El objetivo de este trabajo es describir la distribución de la mortalidad por mesotelioma en Brasil durante el período 1980-2010 **Método:** Se realizó un estudio descriptivo ecológico con el análisis descriptivo de los datos. Se utilizaron los registros del Sistema Nacional de Informaciones sobre mortalidad del DataSUS. **Resultados:** Se encontraron 3.718 muertes por mesotelioma; la mayoría (2.180) se produjo en el Sudeste. Hubo un equilibrio en la mortalidad entre los hombres y las mujeres que muestran una proporción de 1,12: 1; y el 80,7 % de las muertes ocurrió a la edad de más de 50 años. Las tasas de mortalidad estandarizadas por edad aumentaron de 0,64 muertes por millón de habitantes en 1980 a 1,18 muertes por millón de habitantes en 2002. **Conclusión:** Las estadísticas de mortalidad por mesotelioma en Brasil son bajas y no corresponden al volumen de producción ni al uso de asbesto en el país, lo que puede no reflejar la verdadera magnitud de la enfermedad.

Palabras clave: Mesotelioma/epidemiologia; Asbestos/envenenamento; Neoplasias, Vigilancia Sanitaria Ambiental; Brasil