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Incidence and Mortality by the Main Types of Cancer in the City of Cuiabá, Mato Grosso, Between the Years of 2008 and 2016

Incidência e mortalidade pelos principais tipos de câncer no município de Cuiabá, Mato Grosso, entre os anos de 2008 e 2016

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ABSTRACT: ***Objective***: To analyze the temporal trend of the incidence and mortality rate for prostate, breast, colorectal, lung, cervical, stomach and laryngeal cancer among residents in the city of Cuiabá between 2008 and 2016. ***Methods***: Time series study with data from the Mortality Information System and the Population-Based Cancer Registry. Stratified by sex, the proportional distribution of new cases and deaths by age group and the cancer incidence and mortality rates standardized by the world population were calculated. Linear regression was used and the annual percentage change (APC) was estimated. ***Results***: In males, most new cases and deaths, for the main types of cancer, occurred among those aged 50 years or older, and the incidence rate of prostate cancer showed a tendency to decrease in the period (APC=-4.33%). For females, the proportion of new cases and deaths, due to breast and cervical cancer, were more frequent among women aged 50 years or younger, and lung, stomach and colorectal cancer among women aged 50 years or older. The incidence rate of breast cancer showed an increasing trend (APC=3.60%). For both sexes, the mortality rate remained stable. ***Conclusion***: The incidence rate trend varied between sexes, an increase was observed for breast cancer among women and a reduction for prostate cancer among men. The mortality rate for the main types of cancer was stable.

Keywords: Neoplasms. Incidence. Mortality. Time series studies.

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RESUMO: ***Objetivo***: Analisar a tendência temporal das taxas de incidência e mortalidade por câncer de próstata, de mama, colorretal, de pulmão, do colo de útero, de estômago e de laringe entre residentes no município de Cuiabá, Mato Grosso, entre 2008 e 2016. ***Métodos***: Estudo de séries temporais com informações do Sistema de Informação sobre Mortalidade e do Registro de Câncer de Base Populacional. Foram calculadas, por sexo, a distribuição proporcional dos casos novos e óbitos por faixa etária e as taxas de incidência e mortalidade por câncer padronizadas pela população mundial. Foi empregada a regressão linear, e estimou-se a variação percentual anual (VPA). ***Resultados***: No sexo masculino, a maioria dos casos novos e óbitos, para os principais tipos de câncer, ocorreu entre aqueles com 50 anos ou mais, e a taxa de incidência de câncer de próstata apresentou tendência de redução no período (VPA=-4,33%). Para o sexo feminino, a proporção de casos novos e óbitos, por câncer de mama e colo de útero, foi mais frequente entre mulheres com 50 anos ou menos, e câncer de pulmão, estômago e colorretal mais comuns entre as mulheres com 60 anos ou mais. A tendência da taxa de incidência de câncer de mama foi crescente (VPA=3,60%). Para ambos os sexos, a taxa de mortalidade apresentou estabilidade. ***Conclusão***: A tendência da taxa de incidência variou entre os sexos, foi observado aumento para câncer de mama entre mulheres e viu-se redução para câncer de próstata entre homens. A taxa de mortalidade para os principais tipos de câncer apresentou estabilidade.

Palavras-chave: Neoplasias. Incidência. Mortalidade. Estudos de séries temporais.

INTRODUCTION

Cancer is a term that encompasses several types of malignant diseases, which have in common the disordered growth of cells, that can invade adjacent tissues or distant organs[1]. The causes by which the cancer incidence and mortality are increasing rapidly are complex, but reflect population aging and growth, as well as changes in the distribution and prevalence of major risk factors associated with developed societies, such as industrialized diets, smoking, obesity and a sedentary lifestyle[2-4].

Cancer is the main public health problem in the world, it is responsible for the majority of deaths, and also the most important barrier to the increase in life expectancy of the population in the 21st Century[2,3]. In 2020, 19.3 million new cancer cases and 10 million cancer deaths were estimated worldwide[5].

In Brazil, cancer is considered the second leading cause of death, the first place is occupied by cardiovascular diseases, with an occurrence of 450 thousand new cases, non-melanoma skin cancer excluded, estimated for each year of the 2020-2022 triennium. The most common types among men, with the exception of non-melanoma skin cancer, will be prostate, colorectal, lung, stomach and oral cavity cancer, while in women it will be breast, colorectal, cervical, lung and thyroid cancer[6].

The cancer incidence and mortality rates vary between the regions in Brazil. The Southeast region concentrates 60% of the incidence, followed by the Northeast (27.8%) and South (23.4%) regions[6]. A study that analyzed cancer mortality trends in Brazil and in the geographic regions, from 1996 to 2010, showed that the North, Northeast and Southeast regions

showed increasing trends for both sexes, and the Central-West and South regions showed stability[7]. In this sense, studies that analyze regional and local information can be useful to better understand the behavior of the disease in a given population.

Cuiabá, capital of the state of Mato Grosso, underwent an intense process of economic, social and environmental transformation in recent decades, which may have influenced the patterns of illness in the population. Among the most frequent causes of mortality in the city, cancer is the second[8], however, there is still a lack of studies that assess both the mortality and incidence of the main types of cancer in the city.

Information from consolidated databases, such as those obtained by the Population-Based Cancer Registries (RCBP, in the Portuguese acronym) and the Mortality Information System (SIM, in the Portuguese acronym), can contribute to the definition of the priorities and actions aimed at cancer control, as well as the evaluation of the effectiveness of the interventions already instituted[8-10]. Currently, Brazil has 32 RCBPs, four of which are still being implemented, including in the state of Mato Grossso, that has two registries: Cuiabá, which includes coverage of the two largest cities in the state, Cuiabá and Várzea Grande; and its smaller towns[10].

Thus, this study aimed to analyze the temporal trend of incidence and mortality rates for prostrate, breast, colorectal, lung, cervical, stomach and laryngeal cancer among residents in the city of Cuiabá between 2008 and 2016.

METHODS

This is a time series study of new cancer cases and deaths among residents of the city of Cuiabá, capital of the state of Mato Grosso, located in the Central-West region of the country, between the period of 2008 and 2016. For 2021, the estimated population for the city was 623,614 people, with a population density of 157.66 inhabitants per km^2 and a Municipal Human Development Index (MHDI) of 0.785[11].

This study used mortality information extracted from SIM and incidence from the RCBP, as well as population estimates for the city of Cuiabá, from the Brazilian Institute of Geography and Statistics (IBGE) and the Department of Informatics of the Unified Health System (DATASUS) for the city of Cuiabá[8,10,11].

The study period was defined by the availability of the RCBP database, which was updated from 2008 to 2016 through the Extension Project "Surveillance of cancer and its associated factors: update of population-based and hospital registry", in partnership with the Mato Grosso State Health Department (SES/MT) and funding from the agency. The RCBP data was collected through an active search in the hospital services that provide cancer care in the cities in the RCBP coverage area, as well as in pathological anatomy laboratories and private clinics that also provide cancer care[12].

The five types of cancer with the highest mortality in the city of Cuiabá were selected for males (C61-prostate, C18 to 21-colorectal, C33 and 34-lung, C16-stomach and C32- laryngeal)

and females (C-50-breast, C18 to 21-colorectal, C53-cervical, C33 and 34-lung, C16-stomach), according to the International Statistical Classification of Diseases and Related Health Problems (ICD-10).

The proportional distribution of new cases and deaths by age group and the standardized incidence and mortality rates (per 100,000 inhabitants) were calculated for both sexes and each type of cancer. The standardization was performed using the direct method and the world standard population proposed by Segi and revised by Doll and Smith[13].

To estimate the trend of incidence and mortality rates in the period between 2008 and 2016, the calculation of the annual percentage change (APC) and its respective 95% confidence intervals (95% CI) was performed. The APC was obtained from the ratio between the rate at the beginning of the period and the beta of the linear regression[14]. A significant trend was considered when the model presented $p<0.05$. For the analysis, the software R version 4.1.0 was used.

The present study is part of the research project "Cancer and its associated factors: analysis of population and hospital-based records in Cuiabá", approved by the Research Ethics Committee of the Hospital Universitário Júlio Müller (HUJM), opinion number 3,048,183, of November 20, 2018, and of the Research Ethics Committee of SES-MT, opinion number 3,263,744, on April 12, 2019.

RESULTS

In the period between 2008 and 2016, 12,717 new cases and 4,699 deaths from cancer were recorded, with the most frequent cases in females (51.07%) and deaths in males (52.90%). The proportion of cases and deaths in the age group of 60 years and over was, respectively 44.78 and 55.85% in females and 59.07 and 64.20% in males.

For males, for the five types of cancer investigated, more than 75% of cases and deaths occurred among those aged 50 years or older, especially lung, prostate and stomach cancer, with a higher concentration of cases among the elderly, and prostate cancer, in which the majority of deaths occurred among those aged 70 years or older. For females, there was a difference in the distribution of cases and deaths by age group. The proportion of new cases and deaths from breast and cervical cancer was more frequent among women aged 50 years or younger, and lung, stomach and colorectal cancer were more common among women aged 60 years or older (Figure 1).

Of the total number of new male cases, prostate cancer was the most frequent (26.03%) followed by colorectal (6.31%), lung (6.13%), stomach (4.20%) and laryngeal (2.37%), and for females, breast (25.76%), colorectal (7.11%), cervical (7.02%), lung (3.96%) and stomach (2.83%) (Table 1). Figure 2 shows the temporal trend of the incidence rate from 2008 to 2016. For males, the incidence rate of prostate cancer showed a downward trend (APC=4.33; 95%CI -7.36; -1.30), and for females, the incidence rate of breast cancer increased (APC=3.60; 95%CI 1.81; 5.38). For the other causes, the trend was stable for both sexes (Table 1).

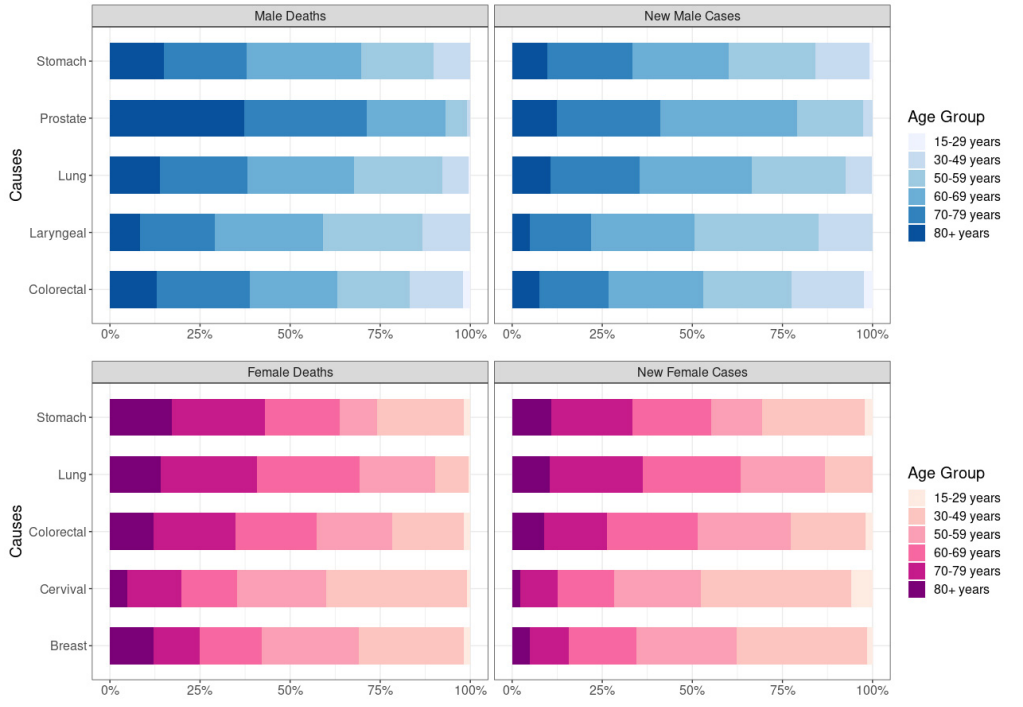

Figure 1. Proportional distribution of new cases and deaths from the five main types of cancer according to age group and sex. Cuiabá (MT), 2008-2016

Table 1. Distribution of cases and trend in the incidence rate of the five main types of cancer, by sex. Cuiabá (MT), 2008-2016.

Cancer	#	%	Average Rate*	APC	95%CI		Interpretation
Male	6,212	48.85					
Prostate	1,617	26.03	74.35	-4.33	-7.36	-1.30	Decrease
Colorectal	392	6.31	15.32	0.04	-0.79	0.88	Stable
Lung	381	6.13	16.35	-0.14	-0.82	0.54	Stable
Stomach	261	4.20	10.85	-0.01	-0.68	0.66	Stable
Laryngeal	147	2.37	5.57	-0.05	-0.67	0.56	Stable
Female	6,495	51.07					
Breast	1,673	25.76	50.34	3.60	1.81	5.38	Increase
Colorectal	462	7.11	14.42	-0.04	-1.14	1.06	Stable
Cervical	456	7.02	13.72	-0.17	-0.96	0.62	Stable
Lung	257	3.96	8.74	0.05	-0.51	6.05	Stable
Stomach	184	2.83	6.06	-0.06	-0.44	0.32	Stable

*Average incidence rate (per 100,000 inhabitants); APC: annual percentage change; 95%CI: 95% confidence interval.

Figure 2. Time trend of standardized rates (100,000 inhabitants) of mortality incidence of the five main types of cancer and by sex. Cuiabá (MT), 2008-2016.

In terms of deaths, the most frequent causes for males were prostate (15.73%), lung (15.57%), stomach (8.37%), colorectal (8.09%) and laryngeal cancer (5.79%), and for females, breast (19.34%), lung (11.21%), colorectal (9.62%), cervical (9.35%) and stomach cancer (5.24%). For the investigated causes and both sexes, the mortality rate was stable in the studied period (Figure 2 and Table 2)

DISCUSSION

In the present study, for both sexes, a higher frequency of new cases and deaths from cancer was observed with increasing age, except for breast and cervical cancer, which were more frequent among women aged 50 years or younger. The time trend of the cancer incidence rate in Cuiabá, from 2008 to 2016, was increasing for breast cancer among women

Table 2. Distribution of deaths and trend in the mortality rate for the five main types of cancer by sex. Cuiabá (MT), 2008-2016.

Cancer	#	%	Average Rate*	APC	95%CI		Interpretation
Male	2,486	52.90					
Prostate	391	15.73	22.33	-0.10	-2.86	2.65	Stable
Lung	387	15.57	20.49	-0.52	-3.64	2.62	Stable
Stomach	208	8.37	13.31	-3.16	-9.30	2.99	Stable
Colorectal	201	8.09	10.55	-0.63	-5.90	4.63	Stable
Laryngeal	144	5.79	7.28	-0.53	-9.53	8.38	Stable
Female	2,213	47.10					
Breast	428	19.34	15.46	0.94	-5.12	6.99	Stable
Lung	248	11.21	12.51	-3.29	-10.59	4.02	Stable
Colorectal	213	9.62	8.54	-0.29	-8.62	8.02	Stable
Cervical	207	9.35	9.22	-2.49	-6.61	1.62	Stable
Stomach	116	5.24	4.04	2.63	-6.87	12.12	Stable

*Average incidence rate (per 100,000 inhabitants); APC: annual percentage change; 95%CI: 95% confidence interval.

and decreasing for prostate cancer among men. The mortality rate trend was stable in the period for all types of cancer analyzed for both sexes.

The types of cancer with the highest mortality among Cuiabá residents were similar to that observed in a study that analyzed the main causes of cancer mortality in the world[2], whose most frequent causes, for men, were lung, liver, stomach, colorectal and prostate, differing only in sequence and with liver cancer instead of laryngeal cancer. For women, the most frequent deaths were breast, lung, colorectal, cervical and stomach cancers, with the same sites and the same sequence found in our study.

A similar pattern was found for the main types of cancer in Brazil, from 1978 to 2017[9], among the most frequent causes of death, for men, changing only the sequence between the five most frequent types. For women, the four most common have the same site and the same sequence, the only exception being stomach cancer, which for Brazil ranked seventh. Similarity was also observed in Mato Grosso[13], from 2000 to 2015, considering both sexes, in which the five types with the highest mortality were lung (12.2%), prostate (8.7%), stomach (7.7%), breast (6%) and liver (4.7%).

The trend of the standardized mortality rate was stable in the period for the main types of cancer and for both sexes. The study that analyzed the trend of general cancer mortality in the country and by region in the period from 1996 to 2010 showed stability of the rate for Brazil and in the Central-West and South regions[7].

However, studies that evaluated the mortality trend for the main types of cancer in the Federative Units between 1990 and 2015[14], in the capitals and other cities of the five

macro-regions of Brazil between 1978 and 2017[9] and in the regions of the country between 1996 and 2016[15] showed different results from those observed in the present study. In the Central-West region[15] and in the state of Mato Grosso[14], among women, there was a tendency for a reduction in cervical and stomach cancer and an increase in breast, lung and colorectal cancer. For men, there was a trend of reduction for the stomach and growth for the prostate, lung, colorectal and esophageal.

The differences in cancer mortality trend patterns between the regions of the country may reflect differences in the human development index (HDI) and in the provision of health resources[15]. Studies show that regions with lower HDI have a higher proportion of late diagnosis, greater difficulty in having access to diagnosis and treatment, worse prognosis and higher risk of death from cancer[16-18]. In addition, there are differences in the implementation of the Strategic Action Plan for Tackling Chronic Diseases and Non-Communicable Diseases in Brazil, which oversees the line of care, with the implementation of clinical protocols and guidelines based on evidence of cost-effectiveness and the access to diagnosis and cancer care through the strengthening and expansion of the cancer treatment network in the Unified Health System (SUS), favoring continuity of the assistance and comprehensive care[19].

The stability of the mortality rate in the city of Cuiabá may indicate an improvement in access to early cancer diagnosis and treatment while still in its initial phase. The offer of specialized care services in oncology is concentrated in the state capital[20]. A study carried out in the Central-West region from 2005 to 2009 showed a negative correlation between the prostate cancer mortality rate and the proportion of annual medical consultations and health plan coverage, both related to access to services[21].

The cancers with the highest mortality found in this study, colorectal, lung, prostate and breast, are associated with a more westernized lifestyle, with higher intake of meat, fat and total calories, consumption of highly processed foods, tobacco use and a sedentary lifestyle[4]. Socioeconomic aspects have been recognized as conditioning factors of inequalities in the cancer burden, and this is probably due to its role as a marker of lifestyle and exposure to other cancer risk factors[22-24].

A review study of ecological studies from 1998 to 2008[23] showed increased mortality from cancers associated with better socioeconomic status – breast and colon – and less favored social conditions – cervical, stomach, head and neck. The city of Cuiabá still has a high mortality rate from cancers associated with infection, such as stomach and cervical[25,26]. Despite indicating a trend towards stability in mortality, it is worth emphasizing the relevance of a closer look at these types of cancer. Measures such as expanding screening and health education regarding the risk factors are essential in controlling these types of cancer.

In the current study, the highest incidence of cancers were breast cancers among women, with an increasing trend in the period from 2008 to 2016, and prostate cancers among men, with a decreasing trend. Breast cancer is the most frequently diagnosed in the female population in the vast majority of countries (154 out of 185) and also the leading cause of cancer death in more than 100 countries. In recent decades the breast cancer incidence rates have increased in most transition countries[2]. This can be attributed to women's greater

exposure to risk factors related to lifestyle, such as tobacco consumption, excessive alcohol consumption, inadequate diet and sedentary lifestyle[4], reproductive factors, such as delayed pregnancy, fewer children and shorter periods of exclusive breastfeeding, and partially to the degree of early detection and screening actions[27].

The study showed inequalities between regions of the country in the distribution of supply and use of procedures for the early detection of breast cancer[28]. Access to breast cancer screening was lower in the North, Northeast and Central-West regions and was related to the socioeconomic condition of these regions: the greater the inequality, measured by the Gini index, the lower the access to breast cancer screening, as well as, the higher the HDI, the greater the number of mammograms[29].

Prostate cancer is the second most frequent in the male population, it's the fifth leading cause of cancer death and the most diagnosed cancer in the countries of the world (105 of 185)[2]. The main risk factors for prostate cancer are older age, ethnicity, family history, a meat rich diet and obesity[2,30]. Unequal access to health services plays a decisive role in delaying diagnosis and treatment[31], and lower-income individuals have a worse prognosis for the disease, which may be related to difficulties in having access to health services[32].

A study that evaluated the incidence rate of prostate cancer based on data from population-based registries from 44 countries, from 1980 to 2012, indicated that the rates during the last five years of the study, between 2008 and 2012, decreased or stabilized[33]. Similar to the present study, in Goiânia (GO), with data from the RCBP, a 4.1% reduction in the incidence rate of prostate cancer was observed from 2008 to 2012[33].

The incidence of prostate cancer in recent decades has been influenced by increased diagnostic resources and prostate-specific antigen (PSA) tests[2,34]. While in countries such as the United Kingdom, Japan, Costa Rica, Brazil and Thailand the influence of PSA can still be observed in the increasing trend of prostate cancer incidence rates, in the United States there has been a decline since the 2000s, due to reduced tracking in PSA screening, and in the years 2011 to 2015, the rate decreased by around 7% per year[2].

Cancer is a multifactorial disease that involves risk factors at different levels, from economic and social to genetic and molecular aspects[22]. Socioeconomic, cultural and environmental characteristics can generate inequalities in exposure and vulnerabilities with reflection on the profile of the cancer incidence and mortality[22,23]. Initiatives to increase access to primary prevention, early diagnosis, treatment and rehabilitation must consider social, regional and health disparities.

Some limitations of the study derive from the quality of the secondary data, resulting from the incorrect or incomplete filling of the optional, essential and complementary variables of the notification form of cancer record in the RCBP, which may reflect the infrastructure of health services and the challenges in management and organization of state and city cancer control programs. However, a great potential of the data recorded in the RCBP Cuiabá is its availability in a historical series until 2016, unlike the data available from Brazil and Latin American countries, which are until 2013[35].

In Cuiabá, in the period from 2008 to 2016, it was observed that new cases and deaths were concentrated in the population aged 50 years or older, except for breast and cervical

cancers, which were more frequent among women aged 50 years or younger. Reduced rates of prostate cancer incidence among men and growth of breast cancer among women were also noted. The trend of the standardized mortality rate was stable in the analyzed period. It is important to point out the need for broader health policies that include health promotion, early screening and a timely treatment. Furthermore, the description of cancer incidence and mortality, especially in Cuiabá, is essential to understanding the reality and to enable support actions, with a focus on reducing cancer morbidity and mortality.

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