https://doi.org/10.1590/1980-549720220015.supl.1

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Stomach cancer incidence and mortality in Greater Cuiabá, Mato Grosso, Brazil, 2000-2016

Incidência e mortalidade por câncer de estômago na Grande Cuiabá, Mato Grosso, 2000–2016

Patrick Francisco de Oliveira Silva[I], Bárbara da Silva Nalin de Souza[I], Francine Nesello Melanda[I], Elizana de Fátima Garcia Soares[I], Mariana Verardi Bringhenti[I], Fernanda Cristina da Silva de Lima[II], Amanda Cristina de Souza Andrade[I]

ABSTRACT: ***Objective:*** To analyze the incidence and mortality trend of stomach cancer in the Greater Cuiabá, in the state of Mato Grosso, Brazil, from 2000 to 2016. ***Methods:*** The incidence information was obtained from the Population-Based Cancer Registry, and the mortality information from the Mortality Information System. Crude and standardized rates were calculated using the direct method, with the world population as reference. The trends were estimated using the Joinpoint regression method, according to sex and age group, and evaluated through the Annual Percent Change (APC) and the Average Annual Percent Change (AAPC). The Joinpoint Regression Program software, version 4.9.0.0, was used. ***Results:*** There was a decreasing incidence trend of stomach cancer in males (AAPC=-5.2; 95% confidence interval — 95%CI -7.7–-2.6), in men aged 60 to 69 years (AAPC=-3.7; 95%CI -5.6–-1.8) and in 70-79 years (AAPC=-3.7; 95%CI -5.6–-1.8), as well as in women aged 50 to 59 years (AAPC=-5.2; 95%CI -7.8–-2.6) and 80 years or older (AAPC=-5.2; 95%IC -7.8–-2.6). The mortality initially increased in women aged 60-69 years (AAPC=28.4; 95%CI 9.7–50.4), decreased for 80 years or older (AAPC=-26.4; 95%CI -38.0–-12.6) and stable for the other age groups and males. ***Conclusion:*** A decreasing incidence trend of stomach cancer was found among men and, when analyzed by age, among elderly males and adults and elderly females, as well as a stability in the mortality, with an initial variation in elderly women. The production of regional information supports the planning of local policies aimed at reducing the burden of disease and deaths, considering unequal risk conditions and access to health services.

Keywords: Stomach neoplasms. Mortality. Incidence. Temporal distribution.

[I]Universidade Federal de Mato Grosso, Institute for Collective Health – Cuiabá (MT), Brazil.

[II]Universidade Federal de Mato Grosso, Support and Development Foundation – Cuiabá (MT), Brazil.

Corresponding author: Bárbara da Silva Nalin de Souza. Avenida Fernando Corrêa da Costa, 2.367, Bloco CCBSIII, CEP: 78060-900, Boa Esperança, Cuiabá (MT), Brazil. E-mail:bnalinsouza@gmail.com

Conflict of interests: nothing to declare – **Financial support:** Mato Grosso State Health Department and Public Labor Ministry (23rd Region)

RESUMO: ***Objetivo:*** Analisar a tendência da incidência e da mortalidade por câncer de estômago na Grande Cuiabá, Mato Grosso, entre 2000 e 2016. ***Métodos:*** Dados de casos novos e óbitos de residentes dos municípios Cuiabá e Várzea Grande foram obtidos no Registro de Câncer de Base Populacional e no Sistema de Informações sobre Mortalidade, respectivamente. Foram calculadas taxas brutas e padronizadas pelo método direto, utilizando-se a população mundial como referência. As tendências foram estimadas pelo método de regressão *Joinpoint*, segundo sexo e faixa etária, e avaliadas por meio da variação percentual anual (*annual percent change* — APC) e da variação percentual média anual (*average annual percent change* — AAPC). Utilizou-se o *software Joinpoint Regression Program*, versão 4.9.0.0. ***Resultados:*** Verificou-se tendência decrescente da incidência do câncer de estômago no sexo masculino (AAPC=-5,2; intervalo de confiança — IC95% -7,7–-2,6), em homens com 60–69 anos (AAPC=-3,7; IC95% -5,6–-1,8) e 70–79 anos (AAPC=-3,7; IC95% -5,6–-1,8), bem como em mulheres com 50–59 anos (AAPC=-5,2; IC95% -7,8–-2,6) e 80 anos ou mais (AAPC=-5,2; IC95% -7,8–-2,6). A mortalidade apresentou, inicialmente, aumento em mulheres com 60–69 anos (AAPC=28,4; IC95% 9,7–50,4), redução para 80 anos ou mais (AAPC=-26,4; IC95% -38,0–-12,6) e estabilidade nas demais faixas etárias e entre homens. ***Conclusão:*** Verificou-se redução da incidência de câncer de estômago em homens e, quando analisada por idade, entre homens idosos e mulheres adultas e idosas, bem como estabilidade na mortalidade, com variação inicial em idosas. A produção de informações regionais subsidia o planejamento de políticas locais que visem à redução da carga da doença e de óbitos, considerando condições desiguais de risco e acesso a serviços de saúde.

Palavras-chave: Neoplasias gástricas. Mortalidade. Incidência. Distribuição temporal.

INTRODUCTION

Stomach cancer is an important cause of incidence and death worldwide. In 2020, it was responsible for approximately 1.1 million new cases and 769 thousand deaths, ranking sixth in incidence (5.6%) and third in mortality (7.7%) among cancers. It was the fourth most frequent type among men (7.1%) and the seventh among women. For mortality, it ranked fourth in males (9.1%) and fifth in females (6%)[1].

In Brazil, for the years of 2020 to 2022, an annual prevalence of 21,230 new cases was estimated, with 13,360 in men (12.8/100,000) and 7,870 in women (7.3/100,000). In terms of incidence this type of cancer appears in fourth place among men and sixth among women[2]. Of the patients diagnosed with stomach cancer, 65% are over 50 years of age, with a peak incidence among men of approximately 70 years of age[3]. Specifically in the Central-West region, it is the fourth most frequent type among men (9.4/100,000) and the sixth among women (6.7/100,000)[4]. There were 15,111 deaths in the country in 2018, of which 9,387 were men (8%) and 5,374 were women (5%). Thus, mortality from this type of cancer stands out, appearing in fourth place among men and sixth among women[2].

Despite the increase in the number of new cases and deaths from stomach cancer, a downward trend in rates has been observed in many countries. This result has been associated with a reduction in *Helicobacter pylori (H. pylori)* infection rates, considered the main risk

factor for the disease, as well as with control of the risk factors related to lifestyle. In addition, the behavior of the rates is also affected by the access to screening services, diagnostic methods and treatment[5].

Considering the magnitude of the morbidity and mortality from the disease and the inequalities in access to health services in the country, it is necessary to investigate the existence of possible particularities in the State of Mato Grosso. Given the above, the objective of the present study is to analyze the trend of the incidence and mortality of stomach cancer in the Greater Cuiabá, from 2000 to 2016.

METHODS

This is a temporal trend study of the incidence and mortality of stomach cancer in the two most populous cities in Mato Grosso, Cuiabá (the capital) and Várzea Grande (city bordering the capital), which make up the region known as the Greater Cuiabá. In 2010, Cuiabá had a population of 551,098 inhabitants (48.8% male), a population density of 157.66 inhab./km^2 and a human development index (HDI) of 0.785. Várzea Grande had a population of 252,596 inhabitants (52.5% male), a population density of 240.98 inhab./km^2 and an HDI of 0.734[6].

The incidence information was obtained from the Population-Based Cancer Registry (PBCR) of the Greater Cuiabá for the period from 2000 to 2016, and is available in the Popular-Based Cancer Registry System (Basepop Web), developed by INCA[7]. The study period was chosen based on the availability of updated information, in partnership with the Mato Grosso State Health Department (SES-MT).

The data source on deaths that occurred between 2000 and 2016 was the Mortality Information System (SIM) and SES-MT. While the population information was obtained from the 2000 to 2010 Demographic Census, for the intercensus periods, population estimates obtained from the Information Technology Department of the Unified Health System (DATASUS) were used[8,9].

The crude and age-adjusted incidence and mortality rates for stomach cancer (C16 in Chapter II of the 10th revision of the International Statistical Classification of Diseases and Related Health Problems – ICD-10) were calculated for each year between 2000 and 2016. The number of new cases or deaths from cancer was divided by the population over the period, multiplying by 100,000 inhabitants. Crude rates were calculated for the entire population, considering all ages, and by age group, using intervals of 40 to 49 years, 50 to 59 years, 60 to 69 years, 70 to 79 years and 80 years or older. They were then standardized by the direct method, considering the standard world population proposed by Segi[10] and modified by Doll et al.[11]

Joinpoint regression was used to analyze incidence and mortality trends, assessing whether, at some points in the period, there are changes in the observed trend pattern. Thus, the annual percentage change (APC) was calculated, which is the direction and magnitude of

the trend results, and the average annual percentage change (AAPC), estimated by calculating the weighted geometric mean of the different APCs with weight equal to the size of the segment for each time interval, using the calendar year as the regression variable[12,13]. The analysis by age groups was performed for 40 years or older, because in Joinpoint regression the series cannot have null rate values. The statistical analyzes was performed using the Joinpoint Regression Program software, version 4.9.0.0 (Statistical Research and Applications Branch, National Cancer Institute, Bethesda, United States)[14]. A significance level of 5% was adopted.

ETHICAL ASPECTS

This study is part of the research project entitled "Cancer and associated factors: analysis of population-based and hospital records", approved by the Ethics Committee of the Hospital Universitário Júlio Muller (CEP-HUJM) under opinion number 3,048,183 of November 20, 2018, and by the Research Ethics Committee of the SES-MT under opinion number 3,263,744 of April 12, 2019. The project has benefitted from the partnership and funding by the Public Ministry of Labor of the 23rd Region since July 2019 (until July 2023), as well as the authorization and partnership with SES-MT.

RESULTS

In the period from 2000 to 2016, 1,132 new cases of stomach cancer were identified, 693 (61.2%) among men and 439 (38.8%) among women. The age group of 60 years and over stood out with a total of 641 new cases (56.6%), of which 405 (63.2%) were male and 236 (36.8%) were female. In the period, 770 deaths from stomach cancer were also observed. Of these, 496 (64.6%) occurred among men and 274 (35.6%) among women. The age group of 60 years and over stood out with 489 deaths in total (63.5%), of which 316 (63.7%) were among men and 173 (63.1%) among women.

The standardized incidence rate in the period was 10.8/100,000 inhabitants, ranging from 19.0 in 2000 to 7.8 in 2016. In males, it was 14.6/100,000 men and ranged from 27.8 to 9.8. Among females, it was 7.6/100,000 women, ranging from 10.8 to 6.3. The standardized mortality rate in the period was 7.6/100,000 inhabitants, ranging from 9.9 to 7.9. In males, it was 10.8/100,000 men and ranged from 16.2 to 10.7. In females, it was 4.9/100,000 women, ranging from 4.3 to 5.7 (Figures 1 and 2).

In the general population, a higher standardized incidence rate was observed at the beginning of the period and in the age group 60 to 69 years, which ranged from 6.0 in 2000 to 2.1/100,000 inhabitants in 2016. In males and females, in the same age group, the variation was from 9.5 to 2.7/100,000 men and from 2.9 to 1.6/100,000 women. The standardized mortality rate was higher in the 70 to 79 age group, ranging from 3.1 to 2.8/100,000

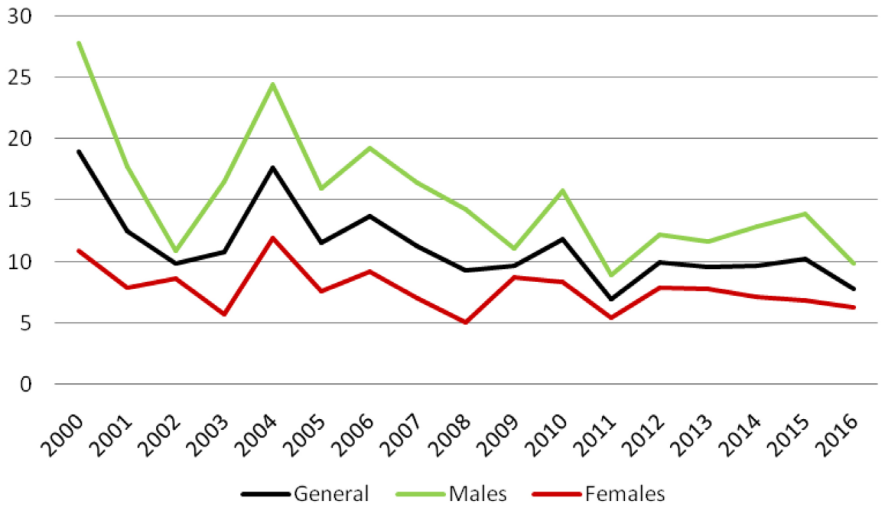

Figura 1. Incidence rates for stomach cancer standardized by age (100,000 inhabitants), by sex. Mato Grosso, 2000-2016.

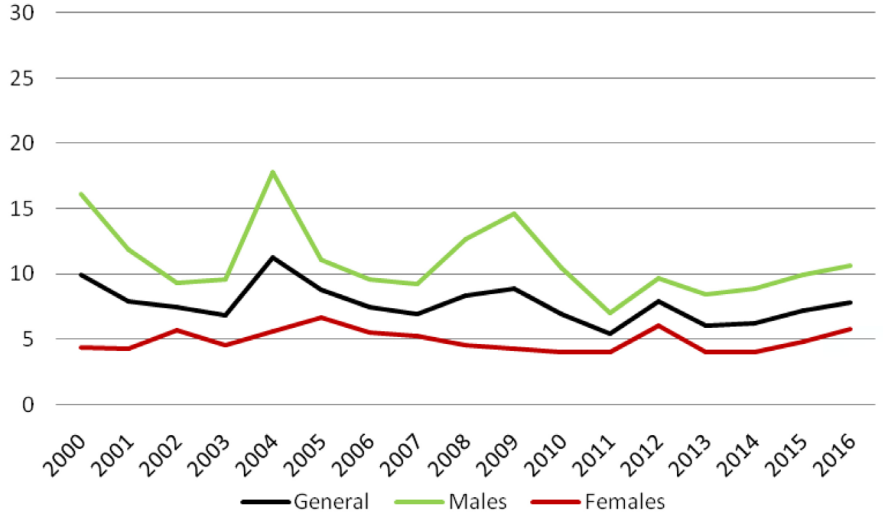

Figura 2. Mortality rates for stomach cancer standardized by age (100,000 inhabitants), by sex. Mato Grosso, 2000-2016.

inhabitants. Comparing the sexes, in the same age group, there was a variation from 5.4 to 4.1/100,000 men and from 1.1 to 1.8/100,000 women (Table 1).

There was a downward trend in the standardized incidence rate for stomach cancer among men (AAPC=-52; confidence interval – 95%CI -7.7–-2.6). When stratified by age group, this decreasing trend was observed among those aged 60 to 69 years (AAPC=-6.2; 95%CI –10.0–-2.3) and 70 to 79 years (AAPC=-4.7; 95%CI -8.2–-1.1). Among women, a downward

Table 1. Frequencies of the new cases, deaths and standardized incidence and mortality rates (100,000 inhabitants), by age group, sex and initial and final years of the time series. Mato Grosso, 2000-2016.

Age Group	Incidence				Mortality			
	New Cases		Standardized Rate		Deaths		Standardized Rate	
	2000	2016	2000	2016	2000	2016	2000	2016
General								
40 to 49 years	10	10	1.5	1.1	9	8	1.4	0.8
50 to 59 years	17	13	3.5	1.3	7	11	1.4	1.1
60 to 69 years	20	15	6.0	2.1	8	13	2.4	1.8
70 to 79 years	18	17	5.1	2.5	11	19	3.1	2.8
80 years or +	8	4	1.8	0.5	5	9	1.2	1.0
All ages	82	63	19.0	7.8	44	62	9.9	7.9
Males								
40 to 49 years	6	4	1.9	0.9	6	4	1.9	0.9
50 to 59 years	13	7	5.4	1.5	5	7	2.1	1.5
60 to 69 years	15	9	9.5	2.7	7	7	4.4	2.1
70 to 79 years	14	11	8.4	3.7	9	12	5.4	4.1
80 years or +	3	2	1.7	0.6	3	6	1.7	1.9
All ages	55	35	27.8	9.8	33	37	16.2	10.7
Females								
40 to 49 years	4	6	1.2	1.2	3	4	0.9	0.8
50 to 59 years	4	6	1.6	1.2	2	4	0.8	0.8
60 to 69 years	5	6	2.9	1.6	1	6	0.6	1.6
70 to 79 years	4	6	2.1	1.5	2	7	1.1	1.8
80 years or +	5	2	2.0	0.4	2	3	0.8	0.6
All ages	27	28	10.8	6.3	11	25	4.3	5.7

trend was also observed between those aged 50 to 59 years (AAPC=-5.2; 95%CI -7.8–-2.6) and 80 years or older (AAPC=-4.4; 95%CI -7.9–-0.8) (Table 2).

An increasing trend was identified in the standardized mortality rate among women aged 60 to 69 years in the period from 2000 to 2006 (AAPC=28.4; 95%CI 9.7–50.4) and a decreasing trend among women aged 80 years or more in the period from 2002 to

Table 2. Trend in the incidence rates for stomach cancer standardized by age, sex and age group. Mato Grosso, 2000-2016.

Sex	Age Group	Time frame	APC* (95%CI)†	AAPC‡ (95%CI)
Male	All Ages	2000–2016	-5.2 (-7.7–-2.6) §	-5.2 (-7.7–-2.6)§
Female	All Ages	2000–2016	-1.8 (-4.0–0.5)	-1.8 (-4.0–0.5)
Male	40 to 49 years	2000–2016	-3.3 (-6.8–0.3)	-3.3 (-6.8–0.3)
	50 to 59 years	2000–2016		-4.3 (-10.5–2.3)
	Trend 1	2000–2002	-34.2 (-61.1–11.3)	
	Trend 2	2002–2016	0.9 (-2.9–4.9)	
	60 to 69 years	2000–2016	-6.2 (-10.0–-2.3)§	-6.2 (-10.0–-2.3)§
	70 to 79 years	2000–2016	-4.7 (-8.2–-1.1)§	-4.7 (-8.2–-1.1)§
	80 years or +	–	-	-
Female	40 to 49 years	2000–2016	0.7 (-5.8–7.7)	0.7 (-5.8–7.7)
	50 to 59 years	2000–2016	-5.2 (-7.8–-2.6)§	-5.2 (-7.8–-2.6)§
	60 to 69 years	2000–2016	-1.9 (-7.6–4.1)	-1.9 (-7.6–4.1)
	70 to 79 years	2000–2016	2.0 (-2.0–6.2)	2.0 (-2.0–6.2)
	80 years or +	2000–2016	-4.4 (-7.9–-0.8)§	-4.4 (-7.9–-0.8)§

*APC: annual percent change; †95% CI: 95% confidence interval; ‡AAPC: average annual percent change; §p<0.05

2008 (AAPC=-26.4; 95%CI –38.0–-12.6). In both sexes, a stable trend was identified in the standardized mortality rate from stomach cancer in general and in the other age groups (Table 3).

DISCUSSION

From 2000 to 2016, in the Greater Cuiabá, in the state of Mato Grosso, there was a decreasing trend in the incidence of stomach cancer among men aged 60 to 79 years and women aged 50 to 59 years and 80 years or older, and a stable trend for other sex and age groups. The mortality showed, at the beginning of the period, an increasing trend for women aged 60 to 69 years and a decreasing trend in the age group of 80 years or older, while it was stable in the other age groups and among men.

In the period from 2003 to 2007, Latin American countries were among those with the highest rates of cancer incidence and mortality, including stomach cancer, possibly due to the higher prevalence of risk factors, such as smoking, physical inactivity, food consumption

Table 3. Trends in standardized stomach cancer mortality rates, by sex and age group. Mato Grosso, 2000-2016.

Sex	Age Group	Time frame	APC* (95%CI)†	AAPC‡ (95%CI)
Male	All Ages	2000–2016	-1.5 (-3.2–0.3)	-1.5 (-3.2–0.3)
Female	All Ages	2000–2016	-1.2 (-3.1–0.7)	-1.2 (-3.1–0.7)
Male	40 to 49 years	2000–2016	-2.6 (-8.6–3.7)	-2.6 (-8.6–3.7)
	50 to 59 years	2000–2016	0.5 (-3.4–4.5)	0.5 (-3.4–4.5)
	60 to 69 years	2000–2016	-2.5 (-7.3–2.6)	-2.5 (-7.3–2.6)
	70 to 79 years	2000–2016	-2.7 (-5.5–0.1)	-2.7 (-5.5–0.1)
	80 years or +	2000–2016	-1.2 (-8.3–6.6)	-1.2 (-8.3–6.6)
Female	40 to 49 years	2000–2016		-1.3 (-19.3–20.6)
	Trend 1	2000–2004	-25 (-47.9–8.0)	
	Trend 2	2004–2007	50.1 (-45.3–312.0)	
	Trend 3	2007–2010	-18.6 (-57.1–54.6)	
	Trend 4	2010–2016	5.8 (-10.8–25.5)	
	50 to 59 years	2000–2016		-0.6 (-27.2–35.7)
	Trend 1	2000–2006	10.3 (-2.1–24.2)	
	Trend 2	2006–2009	-28.6 (-89.2–371.8)	
	Trend 3	2009–2016	4.8 (-4.4–14.9)	
	60 to 69 years	2000–2016		4.0 (-28.9–52.0)
	Trend 1	2000–2006	28.4 (9.7–50.4)§	
	Trend 2	2006–2009	-39.2 (-77.3–62.9)	
	Trend 3	2009–2012	41.8 (-85.5–1284.8)	
	Trend 4	2012–2016	-10.3 (-31.9–18.1)	
	70 to 79 years	2000–2016	2.6 (-3.3–8.8)	2.6 (-3.3–8.8)
	80 years or +	2000–2016		-1.3 (-18.1–18.9)
	Trend 1	2000–2002	39.8 (-59.0–376.7)	
	Trend 2	2002–2008	-26.4 (-38.0–-12.6)§	
	Trend 3	2008–2012	52.5 (-5.3–145.4)	
	Trend 4	2012–2016	-16.6 (-46.5–29.8)	

*APC: annual percent change; †95%CI: 95% confidence interval; ‡AAPC: average annual percent change; §p<0.05

and excess weight and a disproportionate burden of cancers caused by infections. In males, the rates for stomach cancer were 24/100,000 and 10.6/100,000, and in females they were 10.9/100,000 and 4.5/100,000, respectively[15].

Although high in the comparison between the sexes, there was a downward trend in the incidence of stomach cancer among men, especially those aged between 60 and 79 years. Among women, the reduction was observed in the age group of 50-59 years and 80 years and older, with an annual reduction of approximately 5%. According to Torre et al., the incidence of stomach cancer has been declining steadily since the mid-20th century in North America and Europe, and more recently in other countries, including Asia and Latin America. These decreasing trends can be attributed to several factors, including reduced smoking, increased availability of better qualify foods, and reduced infection by *H. pylori*[15].

According to data from the Surveillance of Risk and Protection Factors for Chronic Diseases by Telephone Survey (Vigitel), the prevalence of smoking decreased over time, with a greater difference among men, despite the fact that they had a higher frequency throughout the period[16]. Regarding chronic *H. pylori* infection, it is worth noting that 89% of non-cardiac gastric cancer cases worldwide are infectious and the lower-income countries have a disproportionate burden of infection-related cancers. Therefore, this risk factor, considered the main one for the occurrence of stomach cancer, plays a great role in the formation of regional variations[17].

In a systematic review with meta-analysis that considered publications from 2000 to 2017, there was an overall prevalence of 44.3% (95%CI 40.9-47.7) of *H. pylori* infection worldwide, with the highest value, of approximately 60% found in Latin America. The prevalence was higher in developing countries (50.8%; 95%CI 46.8-54.7) when compared to developed countries (34.7%; 95%CI 30.2-39.3) and in men (46.3%; 95%CI 42.1-50.5) when compared to women (42.7%; 95%CI 39-46.5)[18]. In another review, a prevalence of 17.4% of gastric cancer cases was detected in the population infected with *H. pylori*, with an approximately three times greater chance of developing this type of cancer. Although its control is important, it may not be feasible at the population level and, in addition, other factors need to be considered for prevention[19].

For the detection of *H. pylori*, there are several tests that can be performed, with different rates of specificity and sensitivity, as well as accuracy, which are directly influenced by factors such as age, clinical status and socioeconomic conditions. Therefore, it would be necessary to analyze each specific situation and seek the best alternative in view of the patient's clinical condition and the availability of the exam in the various specialized services[20].

According to the II Brazilian Consensus on Gastric Cancer, the main method of diagnosing this type of cancer is by upper digestive endoscopy with biopsy. It is recommended that the endoscopic examination report must contain accurate information about the location(s) of the lesion(s), approximate size, extension, infiltration, distance from the esophagogastric junction and the pylorus, specifying the sites where the biopsies were performed[21]. In Brazil, as in the United States and Europe, there is no recommendation for screening[22].

However, despite the scarcity of national studies on the subject, a systematic review suggests that endoscopy may be a cost-effective strategy for screening and surveillance of stomach cancer, depending on the population and protocol[23].

Analysis of mortality from stomach cancer in the period from 1970 to 2015 showed that, despite the downward trend in different countries, especially in men, in general the rates remain high in Latin American countries[24]

In Brazil, studies have indicated a drop in the standardized mortality rate for both sexes. Guimarães and Muzi[25] observed, between 1980 and 2009, an annual percentage change of -1.3 in males and -1.5 in females. In the period, stomach cancer presented one of the highest percentage contributions to the mortality of Brazilians in the age groups of 50 to 69 years and 70 years or older. Guerra et al.[26] observed, between 1990 and 2015, a percentage variation of -38.9% among women and -37.3% among men. Furthermore, in the state of Mato Grosso, the same pattern was observed in all the states of the Central-West region, with a percentage variation of -42.6% among men and -32.3% among women. Evaluating the 1996-2012 period, there was a significant reduction for males from 2004 onwards and a stable trend for females[27].

When comparing the trends of standardized mortality rates from stomach cancer between capitals and other cities, Azevedo and Silva et al.[28] found, in the period between 1980 and 2017, a reduction of -2,139 in the country and of -2,395 in the capitals of the Central-West region. In the cities, there was an upward trend at the beginning of the period, followed by a reduction. In Fortaleza, capital of Ceará, the mortality between 1980 and 2007 showed a decreasing trend in both sexes, with an annual percentage change of 2.1% in men and 2.6% in women. When analyzing by period, a decrease of 4.0% in men (1997-2004) and of 4.8% in women (1990-2004) was observed. There was also a progressive increase with age, with a peak between 50 and 70 years[29]. In the present study, when considering the 17 years of observation, despite the fact that the capital of Mato Grosso is considered along with its neighboring city (the second most populous in the state), there was a trend of stability in the rate for the general population and for both sexes when analyzed separately. According to Azevedo and Silva et al., the different pattern found in the capitals of the Central-West may indicate the different regional processes of illness and death[28].

On the other hand, analyzing data on all the types of cancer in Brazil and regions between 1996 and 2010, Barbosa et al. found stability in mortality in both men and women in the Central-West region. For the period of 2026-2030, the forecast is for a reduction in the mortality rate in the Central-West[30]. Similarly, in the present study, the mortality rates were stable for both sex categories. Despite the reduction in male incidence, there was no reduction in the mortality, possibly due to possible failures in secondary prevention and treatment, which contributed to the decrease in survival. Among women, according to age group, there was a fluctuation in the rate over the period, marked by a significant increase and decrease in the initial years among those aged 60 to 69 years and 80 years or older, respectively. However, this was not reflected in the rate trend over the 17 years, which remained stable.

Controlling the prevalence of the risk factors, screening, early detection and improved treatment are fundamental for controlling the incidence and mortality rates. It is suggested that an increase in the prevalence of factors such as smoking, excess body weight, physical inactivity[15], in addition to the influence of the availability of fresh fruits and vegetables, dietary patterns and food[31] preservation methods may prevent a reduction in the rates. It is worth mentioning that access to diagnostic and therapeutic procedures is not evenly distributed across populations, mainly as a result of situations of socioeconomic inequality[28]. Although chronic non-communicable diseases are the main cause of death in the state, there is still difficulty in accessing health services, with little investment in the care network, especially in primary care. Therefore, the control of the morbidity and mortality from these diseases is a great challenge[32].

Therefore, it is believed that this study reveals important information about the occurrence of stomach cancer in the state of Mato Grosso, although there are some limitations inherent to the type of study, such as the use of secondary data and the possible loss of quality with coding errors, underreporting and incomplete data[33]. Relatively small numbers of cases and deaths can also, to some extent, influence the results, producing data without statistical significance and with wide confidence intervals. It is noteworthy, however, that our results are, in this case, conservative, and must be interpreted in the light of this bias. On the other hand, it is important to highlight the gradual improvement in the quality of the state's mortality data between the years 2000 and 2016[32], as well as the importance of the project in updating the state's cancer records – with an active search for information on malignant tumors diagnosed in the period carried out with notifying sources, in addition to the analysis of a wide period, with details by sex and age group. Thus, the potential of information systems in the production of useful regional data for planning local policies aimed at reducing the burden of disease and deaths, influenced by unequal conditions of risk and access to health services, becomes evident.

ACKNOWLEDGEMENTS

To the State Health Department of Mato Grosso and the Public Ministry of Labor (23rd Region) for funding.

ETHICS COMMITTEE IDENTIFICATION/APPROVAL NUMBER

The Ethics Committee of the Hospital Universitário Júlio Muller (CEP-HUJM), Certificate of Presentation for Ethical Assessment (CAAE) 98150718.1.0000.8124, opinion number 3,048,183 of November 20, 2018, and of the Research Ethics Committee of the Mato Grosso State Health Department (SES-MT), CAAE 98150718.1.3003.5164, opinion number 3,263,744, of April 12, 2019.

REFERENCES

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021; 71(3): 209-49. https://doi.org/10.3322/caac.21660
2. Instituto Nacional de Câncer José Alencar Gomes da Silva. ABC do câncer: abordagens básicas para o controle do câncer. 6ª ed. rev. atual. Rio de Janeiro: INCA; 2020. Available at: https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//livro-abc-6-edicao-2020.pdf
3. Instituto Nacional de Câncer José Alencar Gomes da Silva. Estimativa 2020: incidência de câncer no Brasil. Rio de Janeiro: INCA; 2019 [cited on Aug 19, 2021]. Available at: https://www.inca.gov.br/publicacoes/livros/estimativa-2020-incidencia-de-cancer-no-brasil
4. Brasil. Ministério da Saúde. Instituto Nacional de Câncer. Tipos de câncer: Câncer de estômago [Internet]. [cited on Aug 19, 2021]. Available at: https://www.inca.gov.br/tipos-de-cancer/cancer-de-estomago
5. GBD 2017 Stomach Cancer Collaborators. The global, regional, and national burden of stomach cancer in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease study 2017. Lancet Gastroenterol Hepatol 2020; 5(1): 42-54. https://doi.org/10.1016/S2468-1253(19)30328-0
6. Brasil. Instituto Brasileiro de Geografia e Estatistica. Cidades. Cuiabá [Internet] 2020. [cited on Jn 24, 2020]. Available at: https://cidades.ibge.gov.br/brasil/mt/cuiaba/panorama
7. Sistema de Registro de Câncer de Base Populacional. Basepopweb. Instituto Nacional de Câncer José Alencar Gomes da Silva. Rio de Janeiro: INCA; 2005
8. Brasil. Ministério da Saúde. DATASUS. População residente – Censos (1980, 1991, 2000 e 2010), contagem (1996) e projeções intercensitárias (1981 a 2012), segundo faixa etária, sexo e situação de domicílio – Brasil. Available at: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?ibge/cnv/popmt.def
9. Brasil. Ministério da Saúde. DATASUS. População residente – estudo de estimativas populacionais para os municípios, idade e sexo 2000-2021 – Brasil. Available at: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?popsvs/cnv/popbr.def
10. Segi M. Cancer mortality for selected sites in 24 countries (1950-1957). Sendai: Department of Public Health, Tohoku University, School of Medicine; 1960.
11. Doll R, Payne P, Waterhouse JAH. Cancer incidence in five continents vol. I. Berlin: Springer-Verlag; 1966.
12. Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with application to cancer rates. Stat Med 2000; 19(3): 335-51. https://doi.org/10.1002/(sici)1097-0258(20000215)19:3<335::aid-sim336>3.0.co;2-z
13. Clegg LX, Hankey BF, Tiwari R, Feuer EJ, Edwards BK. Estimating average annual per cent change in trend analysis. Stat Med 2009; 28(29): 3670-82. https://doi.org/10.1002/sim.3733
14. National Cancer Institute, Surveillance, Epidemiology and end Results Program. SEER* Stat Software. Version 8.3.6.1. Bethesda: SEER; 2020. [cited on May 31, 2020]. Available at: https://seer.cancer.gov/seerstat/
15. Torre LA, Siegel RL, Ward EM, Jemal A. Global cancer incidence and mortality rates and trends--an update. Cancer Epidemiol Biomarkers Prev 2016; 25(1): 16-27. https://doi.org/10.1158/1055-9965.EPI-15-0578
16. Brasil. Ministério da Saúde. Instituto Nacional de Câncer. Observatório da Política Nacional de Controle do Tabaco. Dados e números da prevalência do tabagismo. Available at: https://www.inca.gov.br/observatorio-da-politica-nacional-de-controle-do-tabaco/dados-e-numeros-prevalencia-tabagismo
17. Plummer M, Franceschi S, Vignat J, Forman D, Martel C. Global burden of gastric cancer attributable to helicobacter pylori. Int J Cancer 2015; 136(2): 487-90. https://doi.org/10.1002/ijc.28999
18. Zamani M, Ebrahimtabar F, Zamani V, Miller WH, Alizadeh-Navaei R, Shokri-Shirvani J, Derakhshan MH. Systematic review with meta-analysis: the worldwide prevalence of helicobacter pylori infection. Aliment Pharmacol Ther 2018; 47(7): 868-76. https://doi.org/10.1111/apt.14561
19. Pormohammad A, Mohtavinejad N, Gholizadeh P, Dabiri H, Chirani AS, Hashemi A, et al. Global estimate of gastric cancer in helicobacter pylori-infected population: a systematic review and meta-analysis. J Cell Physiol 2019; 234(2): 1208-18. https://doi.org/10.1002/jcp.27114
20. Vargas LJ, Deprá LR, Nascimento LEMC, Brito APSO, Garcia HCR, Maneschy RB. Métodos diagnósticos para detecção da infecção pelo h.pylori: revisão sistemática PRMJ 2019; 3(2): e09. http://doi.org/10.4322/prmj.2019.009
21. Barchi LC, Ramos MFKP, Dias AR, Andreollo NA, Weston AC, Lourenço LG, et al. II Consenso Brasileiro de Câncer Gástrico realizado pela Associação Brasileira de Câncer Gástrico. ABCD Arq Bras Cir Dig 2020; 33(2): e1514 https://doi.org/10.1590/0102-672020190001e1514

22. Nogueira-Rodrigues A, Souza ACM, Barbosa AB, Sousa CFPM, Mansur-Pantuzzo ER, Bahia-Coutinho F, et al. Rastreio de câncer na prática clínica: recomendações para a população de risco habitual. Rev Soc Bras Clin Med. 2019; 17(4): 201-10.
23. Canakis A, Pani E, Saumoy M, Shah SC. Decision model analyses of upper endoscopy for gastric cancer screening and preneoplasia surveillance: a systematic review. Therap Adv Gastroenterol 2020; 13: 1756284820941662. https://doi.org/10.1177/1756284820941662
24. Carioli G, Bertuccio P, Malvezzi M, Rodriguez T, Levi F, Boffetta P, et al. Cancer mortality predictions for 2019 in Latin America. Int J Cancer 2020; 147(3): 619-32. https://doi.org/10.1002/ijc.32749
25. Guimarães RM, Muzi CD. Trend of mortality rates for gastric cancer in Brazil and regions in the period of 30 years (1980-2009). Arq Gastroenterol 2012; 49(3): 184-8. https://doi.org/10.1590/S0004-28032012000300003
26. Guerra MR, Bustamante-Teixeira MT, Corrêa CSL, Abreu DMX, Curado MP, Mooney M, et al. Magnitude e variação da carga da mortalidade por câncer no Brasil e Unidades da Federação, 1990 e 2015. Rev Bras Epidemiol 2017; 20(Suppl 01): 102-17. https://doi.org/10.1590/1980-5497201700050009
27. Barbosa IR, Costa ICC, Bernal MM, Souza DLB. Tendência das taxas de mortalidade pelas dez principais causas de óbitos por câncer no Brasil, 1996-2012. Revista Ciência Plural 2016; 2(1): 3-16.
28. Azevedo e Silva G, Jardim BC, Ferreira VM, Junger WL, Girianelli VR. Mortalidade por câncer nas capitais e no interior do Brasil: uma análise de quatro décadas. Rev Saúde Pública 2020; 54: 126. https://doi.org/10.11606/s1518-8787.2020054002255
29. Oliveira JFP, Koifman RJ, Monteiro GTR. Câncer de estômago: tendência da incidência e mortalidade no município de Fortaleza, Ceará. Cad Saúde Colet 2012; 20(3): 359-66.
30. Barbosa IR, Souza DLB, Bernal MM, Costa ICC. Cancer mortality in Brazil: temporal trends and predictions for the year 2030. Medicine (Baltimore) 2015; 94 (16): e746. https://doi.org/10.1097/MD.0000000000000746
31. Karimi P, Islami F, Anandasabapathy S, Freedman ND, Kamangar F. Gastric cancer: descriptive epidemiology, risk factors, screening, and prevention. Cancer Epidemiol Biomarkers Prev 2014; 23(5): 700-13. https://doi.org/10.1158/1055-9965.EPI-13-1057
32. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos Não Transmissíveis e Promoção da Saúde. Saúde Brasil estados 2018: uma análise de situação de saúde segundo o perfil de mortalidade dos estados brasileiros e do Distrito Federal. Brasília: Ministério da Saúde; 2018. Available at: https://bvsms.saude.gov.br/bvs/publicacoes/saude_brasil_estados_2018_analise_situacao_saude_mortalidade.pdf
33. Aquino R, Gouveia N, Teixeira MG, Costa MC, Barreto ML. Estudos ecológicos. Desenho de estudos agregados. In: Almeida Filho N, Barreto ML, editores. Epidemiologia & Saúde: fundamentos, métodos, aplicações. Rio de Janeiro: Guanabara Koogan; 2011. p. 175-85.

Received on: 08/23/2021
Reviewed on: 03/04/2022
Accepted on: 03/04/2022
Preprint: 04/25/2022
https://preprints.scielo.org/index.php/scielo/preprint/view/4014

Author's contributions: Silva, P.F.O.: writing – original draft, writing – review & editing, methodology. Souza, B.S.N.: writing – original draft, writing – review & editing, methodology. Melanda, F.N.: writing – original draft, writing – review & editing, methodology. Soares, E.: writing – original draft, writing – review & editing. Bringhenti, M.V.: writing – original draft, writing – review & editing. Lima, F.C.S.: formal analysis, writing – original draft, writing – review & editing, methodology. Andrade, A.C.S.: formal analysis, writing – original draft, writing – review & editing, methodology.