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Epidemiological assessment of head and neck cancer in Brazil: mortality and regional risk factors

Avaliação epidemiológica do câncer de cabeça e pescoço no Brasil: mortalidade e fatores de risco regionais

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ABSTRACT
The objective of this study was to analyze the real situation of cases and deaths from head and neck cancer (HNC) and to evaluate practices and strategies to improve the population understanding of the main risk factors in Brazil. This was a retrospective descriptive quantitative study that analyzed data on mortality from the HNC in Brazil between 2014 and 2018, from the Atlas of Cancer Mortality. Analyses were carried out for sociodemographic variables, age groups, sex and death rates using the Average Annual Percent Change (AAPC) method and descriptive statistics. HNC death rate affecting men was 369.40% higher than in women. The most affected ages were in the group between 60 and 69 years for men and women (n = 14,159; 2,354), respectively. However, the mortality rate increased for women in recent years. Thus, it is possible to confirm that HNC in Brazil deserves public health attention and demands effective actions applied to the population.

Keywords: Head and Neck Neoplasms. Risk factors. Epidemiology, Descriptive. Medical Oncology.

RESUMO
O objetivo deste estudo foi analisar a real situação dos casos e óbitos por câncer de cabeça e pescoço (CCP) e avaliar práticas e estratégias para melhorar a compreensão da população frente aos principais fatores de risco no Brasil. Trata-se de um estudo retrospectivo descritivo com abordagem quantitativa, por análise de dados sobre mortalidade do CCP no Brasil entre 2014 e 2018, proveniente do Atlas de Mortalidade por Câncer. Foram analisadas as variáveis sociodemográficas, faixas etárias, sexo, verificando taxas de óbitos aplicados ao método de Variação Percentual Média Anual (AAPC) e estatística descritiva. Verificou-se que a taxa de óbito do CCP acometendo homens foi 369,40% maior que nas mulheres. As idades mais afetadas, esteve no grupo entre 60 a 69 anos para homens e mulheres (n= 14.159; 2.354), respectivamente. Houve um crescimento na taxa de mortalidade para mulheres nos últimos anos. Assim, é possível confirmar que CCP no Brasil merece atenção da saúde pública e que demanda ações efetivas aplicadas à população.

Palavras-chave: Neoplasias de cabeça e pescoço. Fatores de risco. Epidemiologia descritiva. Oncologia.

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INTRODUCTION

The term Head and Neck Cancer (HNC) is defined by malignant neoplasms diagnosed in the upper aerodigestive tract. For this type of neoplasm, there is a specific area of oncology that carries out the study, diagnosis, prevention and treatment of various segments of this part of the body, such as tumors found in the regions of the oral cavity, larynx, pharynx and paranasal sinuses[1].

Squamous cell carcinoma is the most frequent histological type of cancer, present in more than 90% cases, with a record of high mortality, while the remaining 10% are presented by the various malignant tumors from odontogenic infections and variants of the squamous cell carcinoma, lymphomas, melanomas and sarcomas[2].

Etiological factors of neoplasms in the head and neck segments are attributed to habits and lifestyle, which influence cancer development, with individual or concomitant action; smoking and alcohol consumption can be cited as the main agents, because when together they have a synergistic effect, becoming preponderant factors, and in addition, the etiology can also be related to the place where the individual lives, exposure to radiation, chemical agents, viruses, genetic predisposition, disease-causing agents, leukoplakia and/or erythroplakia, poor oral hygiene and poor tooth conservation[3].

According to the World Health Organization (WHO), in 2018, there were about 18 million new cases of cancer, close to 10 million deaths worldwide. The global forecast of this burden is to double to about 29 to 37 million new cases by 2040, with a projected global growth of approximately 60% cancer cases in the coming decades, with the largest increases identified in low- and middle-income countries, and the lack of resources for prevention is the main cause for this development[4].

In the period from 2014 to 2015, 576 thousand new cases of cancer were considered in Brazil, including non-melanoma skin cases[5]. Currently, it is estimated that the country may have 625,000 new cases of cancer annually in the triennium from 2020 to 2022, excluding cases of non-melanoma skin cancer, there are a total of 450,000 new cases for each year of the triennium[6].

Taking into account that the epidemiological spread of cancer in Brazil projects an evolution for the coming years, involving a growth in the types and numbers of cancer, including head and neck cancer, mainly associated with socioeconomic status and its various risk factors, consequently, become worrying facts, as it is necessary to monitor and control the incidence of cancer, as well as to examine the transitions in the patterns of this disease[7].

In this way, this study aimed to evaluate data from the Atlas of Cancer Mortality of the National Cancer Institute

(INCA) and literature on epidemiology, focusing on head and neck cancer in Brazil from 2014 to 2014, presenting an analysis of the sociodemographic distribution for the five Brazilian regions and emphasizing the main risk factors.

In view of the above, the authors aimed to contribute to epidemiological studies, as they are of great importance, and allow to analyze the real situation of society, as well as to evaluate and put into practice strategies and actions to have an impact on the understanding of foundations that determine the advance of head and neck cancer in our country.

METHODOLOGY

This was a retrospective descriptive quantitative study, based on the analysis of digital data. The adopted records on HNC mortality were collected by the Atlas of Cancer Mortality - National Cancer Institute (INCA)[8], considering the updated data from 2014 to 2018.

Data collected and used here are public domain and available at the following electronic address: www.inca.gov.br, therefore, it was not necessary to submit the project to the human research ethics committee. Data were analyzed using Microsoft Excel software.

The use of the Atlas of Cancer Mortality, in the present study, was due to the association of information, as it contains digital data, free of charge and publicly, periodically estimates of mortality rates, through the information provided by the sources of the Mortality Information System (SIM/DATASUS), gathering elements on deaths from malignant neoplasms in Brazil until the year 2018; thus, giving results in tabulated configurations, in the form of graphs and maps.

For the assessment of mortality caused by HNC, data were grouped according to the International Classification of Diseases, 10th Revision (ICD-10)[9], organized and selected by malignant neoplasms affecting the upper aerodigestive tract, coded as oral cavity (C00, C02, C03, C04, C05 and C06), oropharynx (C01, C09 and C10), nasopharynx (C11), hypopharynx (C12 and C13), and larynx (C32).

Initially, ICDs of interest were selected in the Atlas of Cancer Mortality (Model 8)[10]. After selecting the topography, the analysis of mortality frequencies with variables adjusted for age was used in this study, by the Brazilian population in 2010, per 100,000 thousand inhabitants, according to sex, location and selected period.

Then, data were analyzed by the Average Annual Percent Change method (AAPC)[11], by neoplasms, for males and females, with analysis of growth or decline trends applicable to health indicators of HNC mortality rates by Brazilian region.

To calculate the AAPC, cases were adjusted by linear regression to the natural logarithm of adjusted rates, using the calendar as the regression variable, that is, $y = a + bx$, where $y = \text{Ln (rate)}$ and $x =$ calendar year, with a 95% confidence level

for the regression of the calculated region and/or sex. After the results of the numbers generated by the linear regression of rates, it was necessary to calculate the AAPC through the β coefficient, for which the application of the Atlas of Mortality (Model 9)[12] was used.

With the calculation of the β coefficient, the average annual percent change of the HNC was obtained and it was possible to identify whether the trends were stationary (p 0.05), downward (p 0.05 and negative regression coefficient) or upward (p 0.05 and positive regression coefficient)[13] in Brazil and its regions.

RESULTS

Board 1 lists the main risk factors for the development of head and neck cancer, which are universally referenced. There was a very large variation in relation to the origin of these factors.

Board 1. Risk factors for the development of head and neck cancer

Smoking
Consumption of alcoholic beverage
Infection with HPV 16
Food diet
Poor oral hygiene
Family history

Source: Galbiatti *et al.* 2013[15]

In the period between 2014 and 2018, there were 54,646 deaths from malignant neoplasms affecting regions of the head and neck in Brazil (C00-C06; C09-C13, C32). Most deaths are among men (82.44%; n= 45,044) compared to women (17.56%; n= 9,596). According to data in Table 1, mortality from head and neck cancer in men was 369.40% higher than in women. The ages most affected by upper aerodigestive neoplasms were in the group between 60 and 69 years for men and women (n= 14,159; 2,354), respectively.

Table 1. Mortality rates by selected ICDs, age-adjusted, by Brazilian populations in 2010, per 100,000 men and women, Brazil, 2014-2018

	Men		Women		All	
Age group	**Deaths (n)**	**Rate[1]**	**Deaths (n)**	**Rate[1]**	**Deaths (n)**	**Rate[1]**
00 to 04	8	0.02	6	0.02	14	0.02
05 to 09	3	0.01	6	0.02	9	0.01
10 to 14	12	0.03	7	0.02	19	0.02
15 to 19	47	0.11	20	0.05	67	0.08
20 to 29	153	0.18	91	0.11	244	0.14
30 to 39	576	0.69	199	0.24	775	0.46
40 to 49	4,568	6.97	687	1.01	5255	3.94
50 to 59	13,252	25.77	1824	3.29	15078	14.11
60 to 69	14,159	45.14	2354	6.49	16515	24.42
70 to 79	8,272	55.26	2161	10.95	10434	30.07
80 or over	3,980	64.36	2241	21.92	6221	37.92
Age unknown	14	0	0	0	14	0
Total	45,044	-	9596	-	54646	-
Brazil Standard rate	-	9.05	-	1.6	-	5.01

Source: Atlas of Cancer Mortality (INCA), 2018; [1]Specific rates.

Figure 1 illustrates the mortality rates found by the selected ICDs, age-adjusted for age, by the Brazilian population in 2010, per 100,000 men, in Brazil, between 2014 and 2018. There was a slight increase in the mortality rate over the years (7.6%), since 2014 with a coefficient of 8.62, peaking in 2017 with a coefficient of 9.29, maintaining the rate of 9.28 in 2018.

Figure 2 illustrates the mortality rates found by the selected ICDs, age-adjusted, by the Brazilian population in 2010, per 100,000 women, in Brazil, between 2014 and 2018. The death rate for women between 2014 and 2015 decreased from 1.55 to 1.52 (-1.93%). There were successive increases between 2016 and 2018, with a coefficient of 1.55 in 2016, increasing to a peak of 1.71 in 2018, that is, there was a growth rate of +10.3% from 2014 to 2018.

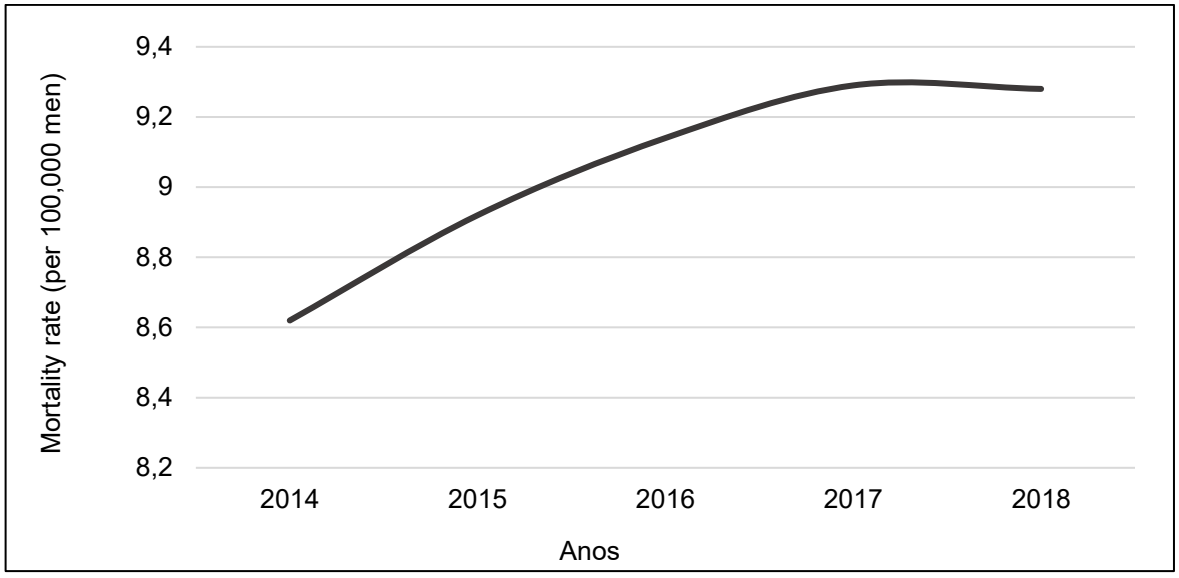

Figure 1. Mortality rates by selected ICDs, age-adjusted, by the Brazilian population in 2010, per 100,000 men, Brazil, between 2014 and 2018 (n=9,596).
Source: Atlas of Cancer Mortality (INCA), 2018.

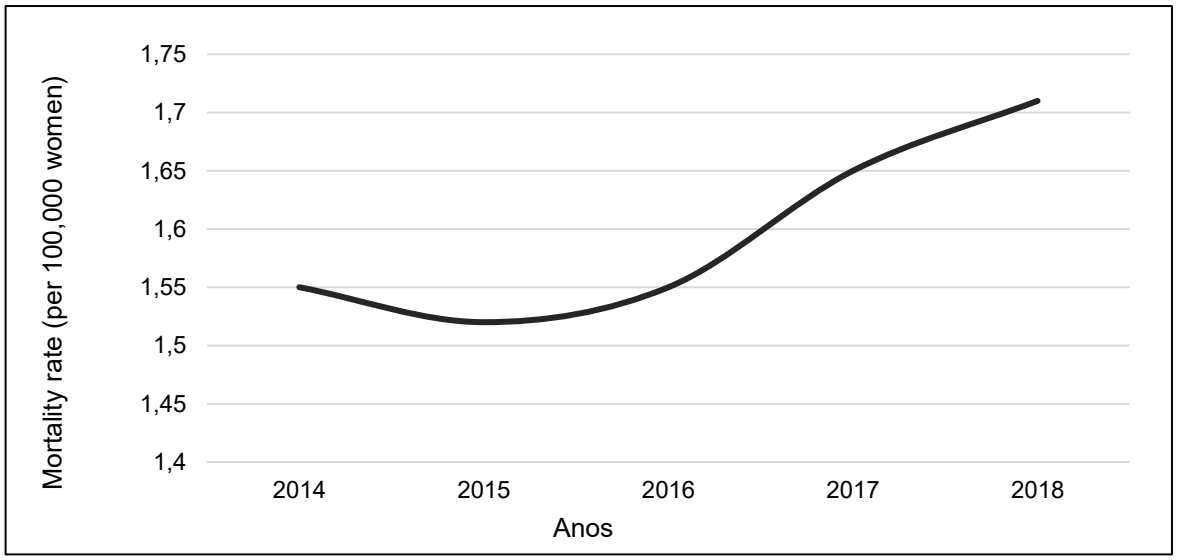

Figure 2. Mortality rates by selected ICDs, age-adjusted, by the Brazilian population in 2010, per 100,000 women, Brazil, between 2014 and 2018 (n=9,596).
Source: Atlas of Cancer Mortality (INCA), 2018

Table 2 lists the comparison of the Average Annual Percent Change (AAPC) for head and neck cancer, according to sex, in Brazil and regions, in the period 2014-2018. In the coefficients for the whole country, there was an increase, both among men and among women, with AAPC of 1.9% (p=0.01) and 2.8% (p=0.04), respectively, and this means that, on average, for the period from 2014 to 2018, there was an increase of 1.9% for men and 2.8% for women, per year in the adjusted rates of malignant neoplasms, which refer to head and neck cancer.

Table 2. Average annual percentage variation for head and neck cancer, according to sex, in the Brazilian regions in the 2014-2018 period. (n=54,646)

		2014-2018			
		AAPC (%)	**Standard error**	**β**	***p-value***
Brazil					
	Men	1.9	0.01	0.01	0.01
	Women	2.84	0.02	0.02	0.04
Regions					
North					
	Men	6.44	0.02	0.06	0.00
	Women	3.84	0.13	0.03	0.44
Northeast					
	Men	3.18	0.02	0.03	0.02
	Women	2.43	0.06	0.02	0.35
Central-West					
	Men	2.54	0.05	0.02	0.27
	Women	4.66	0.13	0.04	0.13
Southeast					
	Men	1.46	0.01	0.01	0.02
	Women	3.26	0.04	0.03	0.13
South					
	Men	0.27	0.01	0.00	0.70
	Women	1.11	0.08	0.01	0.71

Source: Research data, 2020.

Different patterns of adjusted rates of variation in mortality were found in the regions of Brazil, according to gender. A large statistically significant increase was observed in trends for men in the North region, with an increase of 6.44% (p=0.01) and the lowest in the South region, with only 0.27% (p=0.70), adding the variation in the overall trend of +23.85 times in the North region in relation to the South. There was also an increase in the coefficients among women in the Central-West region of 4.66% (p= 0.13) and smaller increases in the South region, with 1.11% (p= 0.71), with a percent change of +419.82%.

Table 3 lists the results of mortality rates by the selected ICDs, age-adjusted, by the Brazilian population in 2010, per 100,000 women, in the regions of Brazil, between 2014 and 2018. In general, the group classified with the highest mortality rate among women was the Northeast region, with a standard rate of 1.82, and the lowest rate was found in the South region, 1.43, in which the most affected age group was 70 to 80 years old or over for all regions. In Brazil, the mean rate found for females, in relation to the selected period, was 1.6.

Table 3. Mortality rates by selected ICDs, age-adjusted, by the Brazilian population in 2010, per 100,000 women, in Brazil, between 2014 and 2018. (n= 9,596)

	Women					
	Specific rates					
Age group	**South**	**Southeast**	**Central-West**	**Northeast**	**North**	**Brazil**
00 to 04	0	0.04	0.02	0.03	0	0.02
05 to 09	0.03	0.03	0	0.01	0	0.02
10 to 14	0.01	0	0.05	0.02	0.02	0.02
15 to 19	0.05	0.12	0.02	0.05	0.02	0.05
20 to 29	0.11	0.1	0.13	0.1	0.1	0.11
30 to 39	0.28	0.23	0.15	0.23	0.22	0.24
40 to 49	1.04	1.12	0.83	1.07	0.82	1.01
50 to 59	3.21	3.45	2.1	3.5	3.14	3.29
60 to 69	7.1	6.51	4.96	6.47	6.13	6.49
70 to 79	12.99	11.76	15.38	9.82	9.48	10.95
80 or over	29.29	21.46	27.56	19.12	18.47	21.92
Age unknown	0	0	0	0	0	0
Brazil standard rate	1.82	1.66	1.59	1.54	1.43	1.6
Classification	1	2	3	4	5	

Source: Atlas of Cancer Mortality (INCA), 2018.

In Table 4, the group classified with the highest mortality rate among men was in the South region, with a coefficient of 9.84, surpassing the mean specific rate found for males in Brazil, which was 9.05, and also highlighting the rates found for females. In addition, records of the lowest rates were observed in the Northeast and North regions, 8.04 and 6.26, respectively, still considering relatively high rates if compared with female data. A higher rate of deaths involving men aged 60 to 80 years or older was also identified.

Comparing the data, the results were contrary in the South region, with the lowest mortality rates for head and neck malignant neoplasms for women, and for men there was a predominance in the South region of the country. There was also similarity between deaths in relation to the age groups of the selected sexes.

Table 4. Mortality rates by selected ICDs, age-adjusted, by the Brazilian population in 2010, per 100,000 men, in Brazil, between 2014 and 2018. (n= 45,044)

	Men			Specific rates		
Age group	**South**	**Southeast**	**Central-West**	**Northeast**	**North**	**Brazil**
00 to 04	0.02	0.01	0.03	0.02	0.05	0.02
05 to 09	0.04	0.01	0	0	0	0.01
10 to 14	0.02	0.02	0	0.05	0.04	0.03
15 to 19	0.08	0.09	0.24	0.13	0.05	0.11
20 to 29	0.18	0.17	0.22	0.19	0.15	0.18
30 to 39	0.66	0.72	0.8	0.7	0.49	0.69
40 to 49	8.24	7.43	7.04	6.37	3.66	6.97
50 to 59	29.1	28.65	24.52	21.71	13.06	25.77
60 to 69	49.51	49.69	44.25	36.68	30.77	45.14
70 to 79	58.42	57.89	55.62	50.53	44.27	55.26
80 or over	60.71	60.89	66.89	71.37	72.48	64.36
Age unknown	0	0	0	0	0	0
Brazil standard rate	9.84	9.69	8.97	8.04	6.26	9.05
Classification	1	2	3	4	5	

Source: Atlas of Cancer Mortality (INCA), 2018.

DISCUSSION

The characteristics of this study are in agreement with results in the literature, which highlight the predominance of deaths from malignant neoplasms in the upper aerodigestive tract among men aged over 50 years[15,16] (Tables 1 and 4), of which deaths are mainly linked to risk factors due to drinking and smoking habits. The change in habits harmful to health is essential to reduce the incidence of cases, both in males and females, in which the disease is relatively rare, but has reached increasing rates[16,17].

In this study, an increase in the number of deaths among women was detected (Figure 2) and increases in the year-adjusted rates of the AAPC from 2014 to 2018 in Brazil (Table 2), revealing that the rate coefficients for females stood out for the male gender in the country. In view of the data, comparing with other studies[15,16,17] on the increase in the incidence of HNC among women and correlate with the consumption of tobacco and alcohol, becoming increasingly common habits among the female population. Thus, the increasing number of the disease in this population are due to changes in lifestyle associated with several risk factors.

Kfouri *et al*[18] present information from the Central-West, Southeast and South regions, revealing that the proportion of HNC attributable to the risk of consuming alcoholic beverages was higher in the Southeast (78%) and South (77%) regions,

with minimum statistical differences, and the Central-West region was classified with the lowest record (62%). As for smoking, the predominant region was the Central-West (90%), followed by the Southeast (87%) and South (86%), considering that smoking had more expressive data in relation to alcohol consumption.

In agreement with the above data, the present study showed that the Central-West region had the second highest ranking in terms of death rates, behind the Northeast region, which had the highest mortality rates for females (Table 3). In addition, the AAPC analysis indicated that the Central-West region presented greater growth each year in the average percent of adjusted rates, among females, for neoplasms affecting the head and neck, in the period 2014-2018, in relation to other regions (Table 2).

As for males, higher death rates were identified (Figure 1) (Figure 2), in which the South region had the highest mortality rate, followed by the Southeast region (Table 4). According to Alvarenga *et al*.[15] in a state in the Southeast region, upper aerodigestive neoplasms predominated in males (86%) and there was a low female predominance (14%), with a mean age of 61 years. Most patients were smokers (83.37%) and drinkers (65.80%), which corroborate the data seen so far.

Through the calculation of AAPC, in this study, statistically significant increases were also verified in the North region, where there was greater growth each year in the average percent of adjusted rates, among males, for neoplasms affecting the head and neck, in the period 2014-2018, standing out from other regions of the country (Table 2). A survey carried out by Sousa *et al*.[19] demonstrated that the highest incidence of HNC cases in a hospital in the North region affected males, with a mean age of 60.6 years, whose sociodemographic factors were already observed in the present study.

Importantly, there are several risk factors leading to aerodigestive neoplasms. In rural activities, for example, individuals are constantly exposed to the sun and in contact with carcinogenic components, which favors cancer development[18]. The literature also suggests that the use of marijuana may increase the risk of head and neck cancer, indicating the interaction between mutagens and risk factors, generating synergism and increasing the predisposition to head and neck cancer20.

In other studies, it is possible to identify the presence of human papillomavirus (HPV) infection, however, the development of malignant neoplasms in the upper aerodigestive tract associated with HPV requires the accumulation of additional factors; thus, it makes the virus a synergistic agent[21]. In addition, there are extensive investigations that demonstrate such synergisms and potential risks for HNC, such as, for example, the frequent use of mouthwashes[22], or even the habit of drinking sugarless yerba mate, can be included as risk factors for the development of the disease, considering the ingestion of hot substance associated with high rates of

oral cancer in Brazil and the huge number of consumers in the South region[23].

Moreover, this proportion of data and research shows that cancers located in the head and neck mainly affect the anatomical regions of the oral cavity, of which oral cancer is ranked among the sixth most common malignant neoplasm in the world and is among the ten most common in Brazil, therefore the highest mortality rate among head and neck neoplasms[24,25]. It is also possible to define other anatomical sites more affected besides the oral cavity, such as tumors located in the larynx, hypopharynx and oropharynx, which can be diagnosed at different stages, but are usually detected in advanced stages[26].

It is also worth mentioning that Brazil has a large population, sociodemographic variations, ethnic and environmental diversity, which are considered important factors for the adoption of measures to assess the burden of disease, the impact of cancer distribution and its reduction in the country. There are, however, divergences in epidemiological data on cancer, which occur due to the lack of population data in the less favored regions of the country, such as the North and Northeast.

In other regions of the country, the identification of real data related to HNC is also impeded by the large variation in the population magnitude and numbers of underreported patients. Furthermore, there are inequalities according to socioeconomic conditions of populations, which influence behavioral activities and lifestyles of individuals, problems with access to health services and life expectancy, observed in some regions of the country[6,7].

In short, this study was limited by the availability of variables and the coverage period in the database. Nevertheless, it is worth mentioning that data and information presented regarding the mortality of upper aerodigestive neoplasms associated with risk factors can contribute to scientific knowledge, as well as subsidize information that can direct health actions or public policies in oncological areas.

CONCLUSION

Through this study, it can be concluded that there was an increase in mortality rates from head and neck cancer in Brazil, between 2014 and 2018, when most of the numbers affect males, but it has been continuously growing among the female population, in addition to reaching all regions of the country in different ways.

Although the government has sought to reduce the number of deaths from malignant neoplasms, with initiatives to prevent new cases, together with national and international bodies, to promote health and reduce preventable medical costs, the low performance of actions developed to reduce the number of deaths.

In line with these factors, there is an impending need for investments in educational aspects for populations, since the development of various neoplasms, as well as neoplasms of the upper

aerodigestive tract, occurs as a result of harmful habits to health.

Thus, we reiterate the need for further studies to evaluate new strategies aimed at population education and reducing case and mortality rates from head and neck cancer.

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