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Mortality from oral and oropharyngeal cancer in Brazil: impact of the National Oral Health Policy

Mortalidade por câncer de boca e orofaríngeo no Brasil: o impacto da Política Nacional de Saúde Bucal

Mortalidad por cáncer oral y orofaríngeo en Brasil: impacto de la Política Nacional de Salud Oral

Amanda Ramos da Cunha [1]
Taiane Schaedler Prass [1]
Fernando Neves Hugo [1]

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Abstract

The objective was to investigate if there is an association between the mortality rates due to oral and oropharyngeal cancer in Brazil and the expansion of access to public primary and specialized dental care services that resulted from the implementation of the National Oral Health Policy, between 2000 and 2013. The mortality data were obtained from the records of the Mortality Information System and the exposure variables were obtained from databases of the Brazilian Ministry of Health and the Brazilian Institute of Geography and Statistics. The main exposures investigated were "coverage of primary dental care" and "number of specialized dental care centers". Additional covariates included "Gini index of household income", "average number of years of study", "proportion of unemployed people" and "proportion of smokers". For the statistical analysis, a random coefficient model was used. There was a statistically significant association between the mortality rates by oral and oropharyngeal cancer with coverage by primary dental care and the number of specialized dental care centers with males. This study found that the expansion of the coverage of primary dental care and the number of specialized dental care centers are associated with the reduction of mortality rates due to oral and oropharyngeal cancer in Brazil. There is plausibility for the association found, which needs to be confirmed by implementation studies.

Mouth Neoplasms; Oropharyngeal Neoplasms; Mortality; Primary Health Care; Health Systems

Correspondence
A. R. Cunha
Universidade Federal do Rio Grande do Sul.
Rua Ramiro Barcelos 2492, Porto Alegre, RS 90035-004, Brasil.
amandaracunha@yahoo.com.br

[1] *Universidade Federal do Rio Grande do Sul, Porto Alegre, Brasil.*

Introduction

Regarded as a global public health issue, oral and oropharyngeal cancers are amongst the most common cancers in the world [1,2,3]. For the year 2020, some 470,000 new cases and 240,000 deaths due to these diseases are estimated [4]. Approximately two thirds of them will take place in developing countries, nevertheless its worldwide incidence indicates a significant variability, depending on the country. Among males, the highest incidence rates of oral cancer are found in India, France, Slovakia and Brazil. In relation to oropharyngeal cancer, France, Slovakia and Switzerland have the highest incidence rates. The incidence of oral and oropharyngeal cancer is higher among men than women [2] and, in most countries, there is an estimated mortality rate, adjusted by age, of 3 to 4 cases per 100,000 men and from 1.5 to 2 cases per 100,000 women [1].

In Brazil, about 15,000 new cases of oral and oropharyngeal cancer have been estimated for the year 2018, representing approximately 3.5% of all new cases of cancer in the country this year. This number is distributed in an estimated risk of 10.86 new cases per 100,000 men and 3.28 per 100,000 women. In the year 2015 the age-adjusted mortality rate was 3.05 deaths per 100,000 inhabitants [5,6].

The consumption of tobacco and alcohol are regarded as the main risk factors for the development of oral cancer [7,8]. In recent decades, the association of the HPV with head and neck cancer started to gain notoriety. This virus is currently considered the main etiological factor for oropharyngeal cancer [9,10,11]. In 2015, this cancer was the most common HPV-associated cancer in the United States, overcoming cervical cancer [12]. The survival rates for oral and oropharyngeal cancers are associated with the tumor stage at the moment of diagnosis, the availability and quality of the treatment provided [13,14], socioeconomic factors [13,15] and the relationship of HPV as an etiological factor [16].

Prevention and an early diagnosis of oral cancer are seen as priorities of the National Oral Health Policy (PNSB, acronym in Portuguese). Since its implementation in 2004, Brazil has been experiencing a significant restructuring on the offer of public dental services. PNSB has reorganized oral health care at all levels, emphasizing the need to increase access by expanding primary health care (PHC) – relying on oral health teams (OHT) of the Family Health Strategy (FHS) – and to ensure the continuity of care with the structuring of specialized dental care centers (SDC) [17]. For this disease, the continuity of care with efficient reference routines between levels of attention is a critical aspect [18] that is considered in PNSB [17]. Between 2000 and 2013, coverage by OHT in Brazil went from 0 to about 40% and the number of SDC increased by around 1,000% [19].

In the first years of PNSB implementation, the use of dental services increased, the lack of access to them decreased and there was a reduction in the inequalities of access and use of these services [20]. However, there is a lack of studies that evaluate the impact of the increase in the provision of primary and specialized dental care after the PNSB on the mortality by oral and oropharyngeal cancer [21,22], with only one study being found from Brazil which explores this issue but without accounting for the effect of the availability of the service that is responsible for diagnosing oral and oropharyngeal cancer, the SDC [23].

Therefore, the objective of this study is to investigate whether there is an association between the mortality rates due to oral and oropharyngeal cancer in Brazil and the expansion of access to primary and specialized dental care that resulted from the implementation of the PNSB, in the period between 2000 and 2013. This is a time span that covers the first decade of the PNSB.

Materials and methods

This is an ecological and analytical study. Data on mortality from oral and oropharyngeal cancer were gathered from the Mortality Information System (SIM), managed by the Brazilian Ministry of Health and made available on the website of the Health Informatics Department (DATASUS; http://datasus.saude.gov.br/). Deaths of individuals aged 15 years or older caused by malignant neoplasms of the oral cavity and oropharynx were included (categories from C00 to C10 of the International Classification of Diseases, 10th Revision – ICD-10; https://icd.who.int/browse10/2015/en#/C00-C14). The data referring to the Brazilian population were gathered from the DATASUS, which intersects information

from the Demographic Census and the Intercensal Projections of the Brazilian Institute of Geography and Statistics (IBGE).

The main exposures investigated in this study were "coverage of primary dental care" (as a percentage of the population that has dental care by OHT available) and "number of SDC". These data were obtained from SUS management support website (http://sage.saude.gov.br/) and from the website of the Primary Care Department, Health Care Secretary, Brazilian Ministry of Health (https://egestorab.saude.gov.br/paginas/acessoPublico/relatorios/relHistoricoCoberturaSB.xhtml).

The covariates that also had their relation with the outcome studied were selected for their influence already described in the etiopathogenesis of oral and oropharyngeal cancer [7,15,24] and for the availability of the data in national databases. These were the "Gini index of household income per capita", "average number of years of study", "proportion of unemployed people with 16 years or more" and "proportion of smokers with 18 years or more".

The covariable "Gini index of the household income per capita" was collected from the DATASUS. The data for the year 2013 was not available and the same value of 2012 was considered. The data for "average number of years of study" and "proportion of unemployed people with 16 years or more" were gathered from the *Brazilian National Household Sample Survey* (PNAD). For both, data from the years of 2000 and 2010 were not available. For the year 2000, the same values of the year 2001 were considered and for the year 2010, the average between 2009 and 2011 was used. In turn, the covariable "proportion of smokers with 18 years or more" was gathered from the research *Risk and Protective Factors Surveillance for Chronic Noncommunicable Diseases through Telephone Interview* (VIGITEL, acronym in Portuguese). For this variable, only the years 2006 to 2013 were available. Thus, for the analysis referring to it, the available period was considered.

All exposure variables were collected by macroregion, except for "proportion of smokers with 18 years or more". The Brazilian territorial division by macroregions considers the classification of the IBGE, which organizes the 27 federative units of the country in 5 macroregions: North, Northeast, Central, Southeast and South. The Southeast and South regions have more than half the population of country. The Southeast is the most industrialized and it includes the major urban area: São Paulo city. The second most urbanized region is the Central and the South has the longest life expectancy. The Northeast is the poorest region economically, with the worst social and health indicators, and the North region has the second worst economic situation [25]. The variable "proportion of smokers with 18 years or more" were only available by capitals of the federative units. In this case, the macroregion data was calculated based on data from its capitals.

Mortality rates (number of deaths from oral and oropharyngeal cancer per 100,000 inhabitants) were calculated and standardized by sex and age group (15-19; 20-29; 30-39; 40-49; 50-59; 60-69; 70-79 years and 80 years or more), by the direct method [26], using the world population of the year 2010 as standard.

A mixed model, also known as a random coefficient model, was used for the statistical analysis of the relationship between the mortality rates due to oral and oropharyngeal cancer with the population coverage for primary dental care, the number of SDC and the other covariables [27,28]. All variables, as well as the outcome, were included in the model for each macroregion. This was done because the model encompassed the effect of macroregions to obtain the general coefficients for the country. The outcome was also calculated for each age group (the same as standardization) and for each anatomical site (categories from C00 to C10 of the ICD-10). The model considered the fixed and random effects associated to each of the variables and this effect was considered statistically non-significant when $p > 0.05$. For each sex, the model was expressed as follows:

$$Y_{RFST} = (\alpha_0 + U_{1RSF}) + (\beta_0 + U_{2RSF}) \times X_{RT} + \varepsilon_{RSFT}$$

where: R = macroregion of the country; F = age group; S = anatomic location; Y_{RFST} = the logarithm of mortality rate per 100,000 inhabitants, referring to the macroregion R, the age group F and the anatomic location S, in time T; X_{RT} = value of the X variable for the macroregion R, in time T; α_0 and β_0 = respectively, the intercept and the slope of the average straight line; U_{1RSF} and U_{2RSF} = random effects; ε_{RSFT} = random error.

It should be noted that "X" represents any of the variables. Before the analysis, the inflation factor of variance (VIF) was calculated to verify the presence of multicollinearity between the variables. The values of the VIF criterion were always higher than 2, a result that indicated the presence of multicollinearity. As a result, the variables were analyzed separately: a mixed model was applied for each variable. Statistical analyses were performed using software R, version 3.2.4 (http://www.r-project.org).

Results

Between 2000 and 2013, there were 61,190 deaths from oral and oropharyngeal cancer in Brazil. The average of the annual coefficients rates were 3.87 deaths per 100,000 inhabitants for both sexes, 7.72/100,000 for males and 2.15/100,000 for females. It is observed that the mortality rate due to oral and oropharyngeal cancer was 3.59 times higher in men than in women. The three anatomical sites responsible for the highest concentration of deaths were oropharynx (31.72%), other parts and unspecified parts of the mouth (21.55%) and other parts and unspecified parts of the tongue (18.95%). The mean annual coefficients of these sites, considering both sexes, were 1.21, 0.86 and 0.73 deaths/100,000 inhabitants, respectively.

The analysis of mortality coefficients by macroregion showed that the Southeast region had the highest rates for males (7.31 deaths/100,000), followed by the South region (7.10/100,000). For females, it was the Northeast region that had the highest rates (1.81/100,000), followed by the Central (1.78 deaths/100,000). This data is detailed in Table 1.

Figure 1 and Figure 2 show, respectively, the evolution of the primary dental care coverage and SDC number in the analyzed period, by macroregion. The two exposure variables show a visible growth in all macroregions between 2000 and 2013. The description of the other covariates, also by macroregion, is presented in Table 2.

The fixed effects revealed that overall mortality rates by oral and oropharyngeal cancer were associated with the "average number of years of study" were significant for both sexes (negative association; $\beta = -0.042$, with $p = 0.00$ for males and $\beta = -0.037$ with $p = 0.01$ for females). For the variable "proportion of unemployed people with 16 years or more", a statistically significant association was also identified for both sexes (positive association; $\beta = 0.029$, with $p = 0.00$ for males and $\beta = 0.016$ with $p = 0.01$ for females). "Coverage of primary dental care and "Number of SDC" presented a statistically significant association with mortality rates in males (negative association; $\beta = -0.096$, $p = 0.05$ and $\beta = -0.025$, $p = 0.01$, respectively), however there was no association for females. There were no significant associations between the mortality rates and "Gini index of the household income per capita" and the "proportion of smokers with 18 years or more", irrespective of sexes. Table 3 presents the regression coefficients (β), 95% confidence intervals and p-value of the results.

Table 1

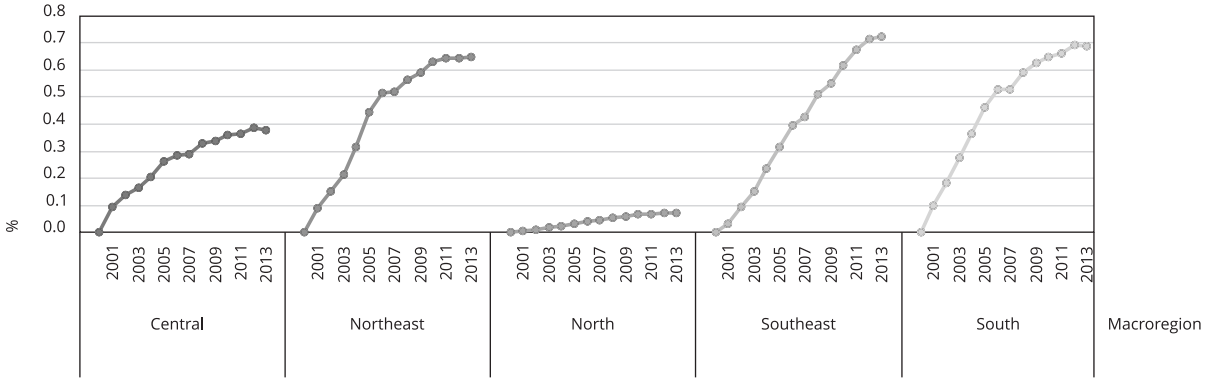
Mortality rates from oral and oropharyngeal cancer, according sex and macroregion. Brazil, 2000-2013.

Macroregion	Male (M)	Female (F)	Ratio M/F
North	2.83	1.31	2.16
Northeast	4.22	1.81	2.33
Central	5.13	1.78	2.88
Southeast	7.31	1.71	4.26
South	7.10	1.53	4.64

Source: prepared by the authors based on data from the Brazilian Mortality Information System (SIM).
Note: average of the annual coefficients adjusted by age and sex (per 100,000 inhabitants).

Figure 1

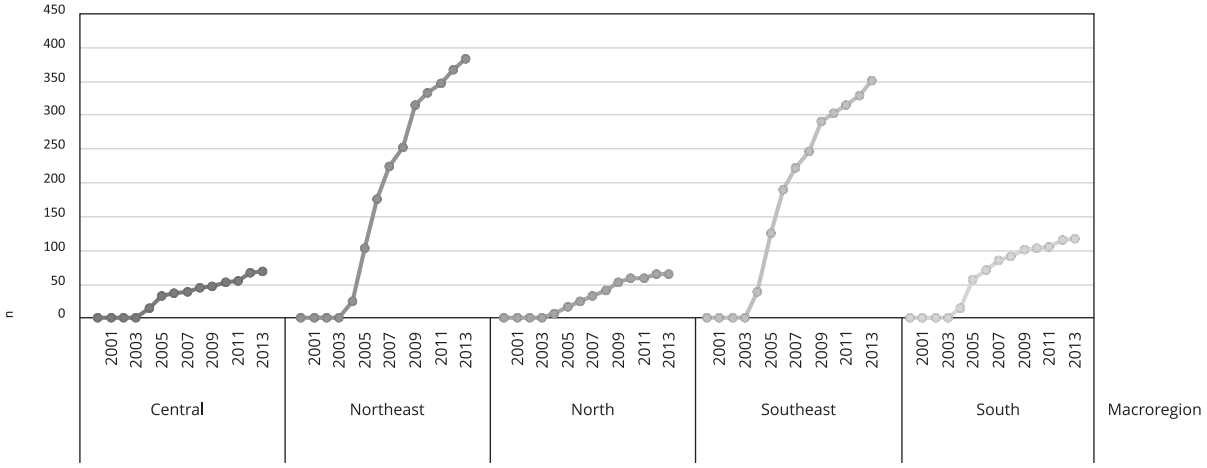
Primary dental care coverage by year, according macroregion. Brazil, 2000-2013.



Source: website of the Primary Care Department, Health Care Secretary, Brazilian Ministry of Health (https://egestorab.saude.gov.br/paginas/acessoPublico/relatorios/relHistoricoCoberturaSB.xhtml).

Figure 2

Number of specialized dental care centers by year, according macroregion. Brazil, 2000-2013.



Source: SUS management support website (http://sage.saude.gov.br/).

Table 2

Mean of the covariates, according macroregion. Brazil, 2000-2013.

Covariate	North	Northeast	Central	Southeast	South
Gini index of household income per capita	0.55	0.58	0.57	0.54	0.51
Average number of years of study					
Male	6.09	4.99	6.83	7.52	7.14
Female	6.66	5.66	7.25	7.46	7.25
Proportion of unemployed people with 16 years or more (%)					
Male	5.53	6.45	5.41	6.83	4.19
Female	11.23	11.15	10.03	11.51	6.95
Proportion of smokers with 18 years or more (%)					
Male	18.10	14.09	16.13	19.75	23.66
Female	7.72	7.63	10.39	14.84	17.63

Source: website of the Health Informatics Department (DATASUS; http://datasus.saude.gov.br/).

Table 3

Fixed effects of the random coefficient model for each one of the covariables considered the independent variable and the logarithm of the mortality rate as the dependent variable.

	Estimate (β_0)	95%CI		p-value
		Lower	Greater	
Male				
Coverage of primary dental care	-0.096	-0.193	0.001	**0.05**
Number of specialized dental care centers	-0.025	-0.045	-0.005	**0.01**
Average number of years of study	-0.042	-0.070	-0.013	**0.00**
Proportion of unemployed people with 16 years or more	0.029	0.016	0.043	**0.00**
Gini index of household income per capita	-0.255	-0.688	0.179	0.25
Proportion of smokers with 18 years or more	-0.002	-0.008	0.005	0.64
Female				
Coverage of primary dental care	-0.088	-0.192	0.016	0.09
Number of specialized dental care centers	-0.017	-0.038	0.005	0.12
Average number of years of study	-0.037	-0.066	-0.007	**0.01**
Proportion of unemployed people with 16 years or more	0.016	0.004	0.027	**0.01**
Gini index of household income per capita	-0.335	-0.858	0.188	0.21
Proportion of smokers with 18 years or more	-0.004	-0.015	0.007	0.48

Discussion

As main findings, it was observed that the mortality rate from oral and oropharyngeal cancer in Brazil, for the male population, has an inverse association with coverage of primary dental care and number of SDC. This suggests that the implementation of PNSB may have led to a reduction in the mortality for these cancers. This association, nonetheless, was not registered for females, which can be expected for a disease about four times more prevalent in men [5].

Moreover, for men and women, the rates decreased with a higher mean number of years of study and increased with a higher proportion of people aged 16 years or more unemployed, confirming the existing evidence that links socioeconomic inequalities to cancer [15,29].

Cancer mortality is an outcome that involves a complex causal chain, including a long latency. However, the present study highlights the significant increase in access to public oral health services with emphasis on primary dental care in the period studied. By observing the data and discussing the plausibility of the events, it indicates that the hypothesis of a favorable impact on mortality rates due to oral and oropharyngeal cancer – as a consequence of this increased access and opportunity for early diagnosis – should not be discarded and deserves attention. Another Brazilian study found that higher mortality rates from oral cancer were found in federative units with lower coverage by the FHS and with fewer financial resources allocated to actions targeting PHC [23]. The results of the present study add to existing knowledge, by showing that the availability of service that is responsible for diagnosing oral cancer (SDC), according the *Brazilian Guidelines for Public Specialized Dental Care Services* [30], was associated with reduced mortality rates.

PHC is the main entrance of the public health system in Brazil (SUS – Brazilian Unified National Health System) and is regarded as a privileged sector for the development of primary prevention (control of risk factors) and secondary prevention (early detection) for oral and oropharyngeal cancer [18]. In Brazil, primary dental care is mainly provided by the OHT. In the historical series studied, there was an expansion from 0% to 38% of coverage by OHT in Brazil [19]. With this increase, many people who did not have access to dental services started to be under the sanitary responsibility of an OHT [20]. In this context, an interpretative dimension of the results is supported by the existence of an association between the expansion of the access to a dentist and an increase of the possibilities of having an early diagnosis. This possibility is especially relevant because oral cancer tends to develop in anatomical regions widely accessible to clinical examination and suspicious lesions can be identified with naked eye [31].

The influence of access to health services in the diagnosis of oral cancer is explored in some studies. The lack of access – defined as the ability of the health system to provide care that is compatible with the needs of people [32] –, is considered to be one of the reasons for the delay in the diagnosis of oral cancer. The existing evidence emphasizes that strategies to reduce delays in diagnosis should include the optimization of oral health services in PHC, which need to be accessible to all, especially the most vulnerable and non-assisted populations [33,34].

There is evidence that the planning for the provision of public oral health services in Brazil takes into account social inequalities, giving preference to the most deprived areas [35]. This pro-equity trait of the expansion of access to dental services of SUS is an important aspect to be regarded when interpreting the results of this study, since the direct association between worse socioeconomic conditions and head and neck cancer is largely consolidated in the literature [15]. In addition, the expansion of public services in poorer areas may favor the access of historically unassisted populations.

Thinking beyond the quantitative increase in access, it is important to highlight that oral cancer prevention and control actions are presented as priorities of the PNSB. Measures such as conducting routine preventive exams for early detection and active search of the population most likely to develop the disease are prescribed in the main guiding documents of primary oral health care actions in Brazil [18,36,37]. Studies with dental surgeons from PHC in the state of Rio Grande do Sul have identified that the professionals interviewed presented a high degree of understanding about their responsibilities for the control of oral cancer [38,39].

In the public oral health network of Brazil, the final diagnosis of oral and oropharyngeal cancer is to be performed on the SDC [30]. To be registered by the Ministry of Health, each SDC has to provide dental care in at least five dental specialties of the Oral Medicine, with emphasis on the diagnosis and detection of oral cancer, being mandatory [40]. In cases where a primary care dentist detects a potentially malignant oral lesion, the OHT is expected to refer the patient to a SDC, which will perform a biopsy and refer the patient to a hospital for cancer treatment, if needed. In the period between 2000 to 2013, the number of SDC in Brazil went from 0 to approximately 1,000 [19].

Regarding the evidence related to the specialized dental care, in a retrospective longitudinal analysis of the screening actions for oral cancer in the older population of the state of São Paulo, a statistically significant reduction in the number of suspicious lesions was identified, as well as the rate of confirmed cases of oral cancer, whereas the extension of the screening in the targeted population increased 4 times approximately, in the 8 years studied. The authors argued that this decrease coincided with the implementation of the PNSB and the subsequent organization of specialized and hospital

dental care, as part of the oral health care network. Currently, the literature indicates the screening of oral cancer for high risk patients – smokers and consumers of large amounts of alcohol [41,42].

It is suggested that, with the implementation of the SDC, there was an increase in the number of Oral Medicine specialists providing access to oral cancer diagnosis that was not available before [43]. It is suggested that this may have had an impact in access not only to earlier diagnosis, but to cancer treatment in hospitals as well, as SDC are responsible for referring patients to appropriate cancer care. Moreover, the literature states that the recent reorganization of the specialized public dental care in Brazil "*appears to be promising, in the sense of providing the public system with a rationality that allows the establishment of efficient routines of reference and counter reference in Dentistry*" [18] (p. S36). These findings are consonant with the results of the present study.

However, it is noted that the structure of an effective public oral health care network in the SUS faces many difficulties. The most important aspect to be considered is related to the coverage of primary dental care and the number of SDC, as they are still far from covering the entire population [19]. Other barriers, such as the lack of professional training, temporary employment, unfavorable work conditions and difficulties to effectively conduct a multidisciplinary teamwork [38,44,45], as well as the unequal geographical distribution of the existing DSC [46], are mentioned.

As per future perspective, implementation studies [47,48] may contribute for more robust analyses of the impacts of the PNSB suggested by the findings of this study. In addition, there is a complex chain of factors related to oral and oropharyngeal cancer mortality in populations that need to be considered concomitantly, such as exposure to risk factors, evolution of treatment techniques, socioeconomic factors, etc. The relevant variables that were available in national databases were considered in the present study, however, multicollinearity did not allow a reliable multivariate analysis. There is plausibility for the association found, but this needs to be more robustly investigated.

The finding that mortality rates decrease as the number of years of schooling increases and also with the increase in the proportion of the unemployed with 16 years or more, for both men and women, is in line with previous literature on the subject [15,29]. The lack of association of the variable "proportion of smokers with 18 years or more" with mortality rates is likely to be related to the large latency period between exposure to risk factor and death from cancer, not contemplated in a historical series of 14 years [49].

This study presents other limitations. Ecological studies have the potential to raise association hypotheses and cannot assess causality. This study analyzed secondary data, therefore there is no possibility of ensuring the quality control of variables. Nevertheless, all data were obtained from official sources, validated by the Brazilian Ministry of Health. Regarding the reliability of the data of mortality by causes, it is believed that the Brazilian data are as trustworthy as those from any other country with a long tradition in the outlining of these statistics, such as the United States and other European countries [50]. A similar observation is obtained when only the mortality from oral cancer is considerate [51].

Measures related to the cessation of smoking and consumption of alcoholic beverages are the only solidly recommended initiatives for the reduction of morbimortality from oral, oropharyngeal and head and neck cancer. Nonetheless, there is a need for scientific evidence which may clarify new paths [49,52,53]. The results of this study indicate that the expansion of the coverage of primary dental care and the number of SDC, the first representing a measure of access to dental care and the second availability of diagnosis and comprehensive dental care, may be related to a reduction in mortality rates due to oral cancer and oropharyngeal cancer in Brazil. Other methodological designs must be explored so that the presence of causality can be determined.

Contributors

A. R. Cunha contributed to the study design, data collection, analysis and interpretation, and writing. T. S. Prass and F. N. Hugo contributed to the study design, data analysis and interpretation, and critical review of the paper. All authors approved the final version of the paper.

Additional informations

ORCID: Amanda Ramos da Cunha (0000-0002-6358-5582); Taiane Schaedler Prass (0000-0003-3136-909X); Fernando Neves Hugo (0000-0003-2222-7719).

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Resumo

O estudo teve como objetivo investigar a presença de associação entre as taxas de mortalidade por câncer de boca e de orofaringe no Brasil e a ampliação do acesso aos serviços odontológicos de atenção primária e especializados na rede pública, resultado da implementação da Política Nacional de Saúde Bucal entre 2000 e 2013. Os dados de mortalidade foram obtidos dos registros do Sistema de Informações sobre Mortalidade e as variáveis de exposição foram extraídas das bases de dados do Ministério da Saúde e do Instituto Brasileiro de Geografia e Estatística. As principais variáveis de exposição foram "cobertura por equipes de saúde bucal" e "número de centros de especialidades odontológicas". As outras variáveis foram "índice Gini de renda domiciliar", "média de anos de escolaridade", "proporção de pessoas desempregadas" e "proporção de fumantes". A análise estatística usou um modelo de coeficientes aleatórios. Houve uma associação estatisticamente significativa entre as taxas de mortalidade por câncer de boca e orofaríngeo e a cobertura por equipes de saúde bucal e o número de centros de especialidades odontológicas, entre os indivíduos do sexo masculino. O estudo mostrou que a ampliação da cobertura de atenção primária em odontologia e o número de centros de especialidades odontológicas estão associados a uma redução nas taxas de mortalidade por câncer de boca e orofaríngeo no Brasil. Há plausibilidade na associação estatística, que deve ser confirmada através de estudos de implementação.

Neoplasias Bucais; Neoplasias Orofaríngeas; Mortalidade; Atenção Primária à Saúde; Sistemas de Saúde

Resumen

El objetivo fue investigar si había una asociación entre las tasas de mortalidad, debidas al cáncer oral y orofaríngeo en Brasil, y la expansión del acceso a los servicios públicos de atención primaria y servicios especializados en atención dental que fueron resultado de la implementación de la Política Nacional de Salud Oral, entre el año 2000 y el 2013. Los datos sobre mortalidad se obtuvieron de los archivos del Sistema de Informaciones sobre Mortalidad y las variables de exposición se obtuvieron de bases de datos del Ministerio de Salud de Brasil y del Instituto Brasileño de Geografía y Estadística. Las exposiciones principales investigadas fueron "cobertura de la atención primaria dental" y "número de centros especializados en atención dental". Las covariables adicionales incluyeron: "índice de Gini de ingresos por hogar", "promedio del número de años de estudio", "proporción de individuos desempleados" y "proporción de fumadores". Para el análisis estadístico, se utilizó un modelo de coeficiente aleatorio. Hubo una asociación estadísticamente significativa entre las tasas de mortalidad por cáncer oral y orofaríngeo con cobertura por parte de la atención primaria dental y el número de centros especializados en cuidado dental, con hombres. Este estudio descubrió que la expansión de la cobertura del cuidado dental primario y del número de centros especializados en cuidado dental están asociados con la reducción de las tasas de mortalidad, causadas por cáncer oral y orofaríngeo en Brasil. Es plausible por la asociación hallada, pero necesita confirmarse mediante estudios de implementación.

Neoplasias de la Boca; Neoplasias Orofaríngeas; Mortalidad; Atención Primaria de Salud; Sistemas de Salud

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