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Investigation of the incidence of oral cancer in the municipalities of the state of Sao Paulo-Brazil: a retrospective observational cross-sectional study

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Abstract

Introduction: The etiology of Oral Cancer (OC) is multifactorial, resulting from several factors that predispose to the development of this pathology, with a high incidence and mortality, and is among the 10 most common pathologies in the world. **Objective:** It was to carry out a retrospective longitudinal observational study on the incidence of oral cancer in patients treated at public health units in the municipalities of the State of Sao Paulo-Brazil, as well as to present the main clinical and demographic characteristics of these patients. **Methods:** This study followed a retrospective observational cross-sectional model (2018-2022), following the rules of clinical research of the STROBE. The present study used the database of the public health system in Brazil on the incidence and prevalence of oral cancer in health units in 467 municipalities in the State of São Paulo-Brazil, whose data are available for public consultation and do not require approval. by the research ethics committee. Participants with oral cancer records of different ethnicities, aged over 20 years, and of both genders were included. Participants who had missing registration data were excluded. For data analysis, the database was built in a Microsoft Excel spreadsheet, which was exported to the Minitab 18® statistical program. One-Way ANOVA with $p>0.05$ was applied without a statistical difference in the CI95%. **Results:** The total number of municipalities in the State of São Paulo-Brazil analyzed was 467. Suspected oral malignancy did not present a significant statistical difference between the years 2018 and 2019 (0.33% vs. 0.30%), with $p>0.05$ in CI95 %. The highest incidences of suspected oral malignancy occurred in 2018 and 2019. In addition, it was evidenced that the most frequent histological type was squamous cell carcinoma in all the years analyzed. Also, bad habits such as alcoholism, smoking, excessive exposure to the sun, and also genetic predisposition, the presence of HPV did not show to influence statistically the occurrences of oral neoplasms. **Conclusion:** Based on the objective of this study, the incidence of oral cancer in the municipalities of the state of São Paulo-Brazil was higher in the years 2018 and 2019, regardless of the action of predictors such as smoking, alcohol consumption, HPV, genetic predisposition and age. However, further studies need to be carried out in the periods from 2020 to 2022 to know the population that was absent due to the COVID-19 pandemic.

Keywords: Oral cancer. Incidence. Prevalence. Prevention. Public health system.

Introduction

The etiology of Oral Cancer (OC) is multifactorial, resulting from several factors that predispose to the development of this pathology, with a high incidence and mortality, and is among the 10 most common pathologies in the world [1,2]. The areas that suffer most from the disease are the tongue, specifically the posterior lateral border, mouth floor, gums, mucosa, tonsils, retromolar region, dorsum of the tongue, soft palate, and hard palate [3,4]. The survival rate of early diagnosis in the early stages ranges from 53% to 68%, while the diagnosis of advanced cancer is approximately 41% and 27% and in the late stage, it is regrettably 70 to 80% [4].

In this scenario of the incidence and prevalence of oral cancer, clinical recognition and evaluation of lesions

of the oral mucosa can detect up to 99% of cancers [5]. The lesion needs to disappear within two weeks and must be biopsied [6,7]. Surgical biopsy remains the gold standard for diagnosing oral cancer. Additionally, adjunctive tools have been developed to aid diagnoses, such as vital toluidine blue staining and autofluorescence imaging [8]. In this context, despite the epidemiological data, OC is preventable, since most of the different risk factors, such as tobacco use, alcohol consumption, and chewing betel nut, are behaviors that increase the probability of the disease. Thus, anticipating the diagnosis begins with the identification of potentially malignant lesions of the oral mucosa and inflammatory processes [8,9].

In this scenario, the most common type (94% to 96% of cases) of oral cancer is squamous cell carcinoma (SCC) or squamous cell carcinoma that affects the most common sites of this pathology are the tongue (26%) and the lower lip (23%) [10,11]. Furthermore, OC was divided into categories such as salivary gland tumors, epithelial tumors, mesenchymal tumors, bone tumors, hematological tumors, odontogenic tumors, and others [11]. In this aspect, the dentist is the health professional who has an important role in the actions and a strategic role [12].

Therefore, the present study aimed to carry out a retrospective observational cross-sectional study on the incidence of oral cancer in patients treated at public health units in the municipalities of the State of Sao Paulo-Brazil, as well as to present the main clinical and demographic characteristics of these patients.

Methods

Study Design

This study followed a retrospective observational cross-sectional model (in the years 2018 to 2022), following the rules of clinical research of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology), available at: https://www.strobe-statement.org/. Public records of oral cancer in the municipalities of the State of Sao Paulo, Brazil were consulted.

Data Sources

The present study used the database of the public health system in Brazil on the incidence and prevalence of oral cancer in health units in 467 municipalities in the State of Sao Paulo-Brazil, whose data are available for public consultation and do not require approval by the research ethics committee. For the literary search for the composition of the textual part of this article, the search strategy was performed in the PubMed, Cochrane Library, Web of Science and Scopus, and Google Scholar databases. The present study was carried out from February to May of 2022. The main descriptors (MeSH Terms) used were "*Oral cancer. Incidence prevalence. Prevention. Public health system*". The rules of the word PICOS (Patient; Intervention; Control; Outcomes; Study Design) were followed.

Sample Size - Number of Participants

The number of participants with suspected malignancy in oral health in the years 2018 to 2022 was 1,406, 1,896, 221, 721, and 3, respectively.

Patient Eligibility – Inclusion and Exclusion Criteria

Participants with oral cancer records of different ethnicities, aged over 20 years, and of both genders were included. Participants who had missing registration data were excluded.

Statistical Analysis

For data analysis, the database was built in a Microsoft Excel spreadsheet, which was exported to the Minitab 18® statistical program (version 18. Minitab. LLC. State College. Pennsylvania, USA). The variables were presented in the form of a percentage, average, and standard deviation. Depending on the Gaussian distribution (Normality test), the comparisons of the variables were performed using the Kruskal-Wallis Test, with $p<0.05$ with a statistical difference in the CI95%, and One-Way ANOVA with $p>0.05$ without a statistical difference in the CI95%.

Results

Summary

The total number of municipalities in the State of São Paulo-Brazil analyzed was 467. Table 1 presents the general clinical and demographic data found in the consultation of this study. The suspicion of oral malignancy showed no statistically significant difference between the years 2018 and 2019 (0.33% vs. 0.30%), with $p>0.05$ in the CI95% (**Table 1**).

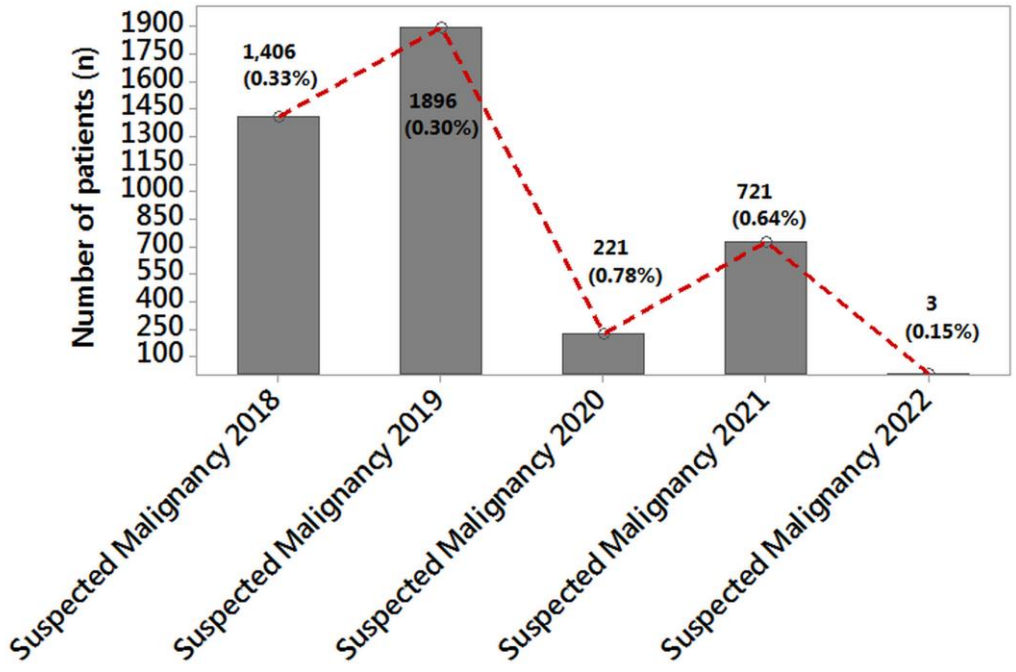
Figure 1 graphically represents the oscillation in the incidence of suspected oral malignancy in the years 2018 to 2022, highlighting the highest incidences between the years 2018 and 2019.

Table 1. General clinical and demographic data.

	2018 (Total=422,149)	2019 (635,754)	2020 (Total=28,682)	2021 (Total=112,172)	2022 (Total=2,035)
Suspected malignancy	1406 (0.33%)*	1896(0.30%)*	221(0.78%)**	721 (0.64%)**	3 (0.15%)**
Gender	M=830	M=1057	M=121	M=432	M=2
(Male(M)/Female(F))*	F=576	F=839	F=100	F=289	F=1
Ethnicity (Majority white)*	1268	1438	198	527	3
Smoking*	485	521	70	180	0
Alcoholism	181**	251**	98*	95*	1**
HPV	3	5	2	2	0
Genetic predisposition	48	68	17	36	1
Sun exposure*	96	167	66	86	1
Benign neoplasm*	344	541	47	65	2
Malignant neoplasm*	242	346	15	93	0
Most frequent histological type*	squamous cell carcinoma (n=180)	squamous cell carcinoma (n=216)	squamous cell carcinoma (n=126)	squamous cell carcinoma (n=168)	squamous cell carcinoma (n=2)

***p>0.05, no statistical difference in CI95%.**
****p<0.05, with a statistically significant difference in the CI95%.**

Figure 1. Oscillation in the incidence of suspected oral malignancy in the years 2018 to 2022.



Discussion

With a total of 467 municipalities analyzed in the State of São Paulo, Brazil, the results of the present study showed that the incidence of suspected malignancy in oral health in the years 2018 to 2022 ranged from 1406 (0.33%), 1896 (0.30%), 221 (0.78%), 721 (0.64%) and 3 (0.15%), respectively (**Table 1** and **Figure 1**). The lowest values found in the years 2020 to 2022 were due to COVID-19 since there was a significant reduction in the number of patients who attended the health units, with a lower number of cases, even with the use of teleconsultation.

In addition, it was evidenced that the most frequent histological type was squamous cell carcinoma in all the years analyzed. Also, bad habits such as

alcoholism, smoking, excessive sun exposure, and even genetic predisposition, the presence of HPV did not show a statistical influence on the occurrence of oral neoplasms (**Table 1**).

In this context, as prevention tools, the early detection and treatment of OC are important predictors to improve survival and reduce mortality [13-16]. The diagnostic process begins with a clinical oral examination, with visual inspection and digital palpation [17,18]. A clinical thorough inspection of the oral cavity can detect up to 99% of oral cancers [18].

In this context, in the initial period, the OC can be asymptomatic. It is necessary to identify persistent mouth sores and/or pain, localized changes in the appearance of the oral mucosa, localized changes in the consistency of the oral mucosa, persistent white or red spots or mixed white and red spots of the oral mucosa, raised spot or plaque on the oral mucosa, lump or persistent growth in the oral mucosa, a bleeding area located in the oral mucosa as proposed by the World Health Organization and the National Institute of Dental and Craniofacial Research and the American Dental Association [16].

In this sense, the routine cytological examination of a smear collected from the epithelial surface of the oral mucosa has low sensitivity and specificity to serve as a predictive diagnostic tool for squamous cell carcinoma. Also, brush biopsy and micro biopsy have been proposed [17-21]. Besides, other types of diagnosis have been developed to help overcome the limits of the standard oral clinical examination [13], highlighting toluidine blue staining, light-based detection techniques, and salivary biomarkers [18].

Also, human saliva presents organic and inorganic molecules, proteins, peptides, and electrolytes, representing more than 100 biomarkers [22-24], pointing to pathological predictors such as viruses, cytokines (IL-1b, IL-8, TNF-α), protein receptors (CD44) [23,24], and DNA and RNA markers [24-26].

Also, self-examination is an effective strategy for reducing the levels of mortality and morbidity caused by this pathology, making clear the importance of health education in improving people's living conditions [1,2]. The dentist discloses the information, in addition to providing guidance, and encouraging self-examination so that it can be diagnosed early, preventive work, giving the chance of cure [1-2].

Besides, a study found that OC caused by chewing betel nuts has a poor prognosis. Thus, this study evaluated a Health Belief Model intervention using a lay health counselor (LHAs) for OC screening and mouth self-examination (MSE) in Aboriginal communities. Intervention (IG; n = 171) and control (CG; n = 176) groups. Participants in the IG were 2.04 times more likely to perform a monthly MSE than those in the CG and showed significantly higher levels of self-efficacy for CO and MSE [27].

Besides, a study with 98 patients (n = 49/group) evaluated the usefulness of a portable autofluorescence device (OralID) to detect oral premalignant lesions. The positive potential malignant lesions (PMLs) observed in the group without the use of OralID were 89.47% when compared with biopsies, while in the group with OralID it was 95.24%. Thus, a gain of 8.09% more sensitivity and 11.36% more specificity was observed with the OralID fluorescence test [28].

In addition, a study compared the quality of two different cell harvesting techniques. Thus, cell smears were collected from 10 orally healthy individuals from the palatal mucosa at two different times, baseline and 4 weeks later. The slides from both techniques were stained by Giemsa (n=40) and May-Gruenwald Giemsa (n=40). Liquid-based cytology showed statistically significant improvement compared to conventional glass sides. The thin layers, which were performed by liquid-based cytology, showed significantly better results in parameters such as uniform distribution, cell overlap, cell deformation, mucus, microbial colonies, and debris. The conventional glass slide approach showed more cell overlap and foreign material contamination than thin layers, which were performed by Orcellex® Brush cell collectors [29].

Also, a study evaluated 376 cases of odontogenic tumors from an oral pathology service regarding age, sex, anatomical location, and histological diagnosis. Keratocystic odontogenic tumors (31.6%) were the most common, followed by ameloblastoma (28.5%) and odontoma (22.6%). The mean age was 32.2 years, and more than half of the patients (52.1%) were in their second and third decades of life. The male/female ratio was 1:1.37, with a mandible/mandible ratio of 1:2.1 [30].

Conclusion

Based on the objective of this study, the incidence of oral cancer in the municipalities of the state of São Paulo-Brazil was higher in the years 2018 and 2019, regardless of the action of predictors such as smoking, alcohol consumption, HPV, genetic predisposition, and age. However, further studies need to be carried out in the periods from 2020 to 2022 to know the population that was absent due to the COVID-19 pandemic.

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Ethics approval
Not applicable.

Informed consent
Not applicable.

Data sharing statement
No additional data are available.

Conflict of interest
The authors declare no conflict of interest.

Similarity check
It was applied by Ithenticate@.

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