

Occupations associated with head and neck cancer in a city in Southern Brazil, 1998 to 2012

Ocupações relacionadas ao câncer de cabeça e pescoço em uma cidade do Sul do Brasil, 1998 a 2012

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ABSTRACT | Background: Cancer is a multifactorial disease and depends on multiple stages. Eliminating risk factors contributes to reduce the incidence of disease or modifies its progression. Identifying risk factors for head and neck cancer associated with definite occupations might complement surveillance actions and help in the implementation of preventive measures in the workplace. **Objective:** To identify the occupations of patients with oral cavity (OCC) or oropharyngeal (OPC) cancer in Curitiba, Parana, Brazil. **Methods:** Cross-sectional study in which we analyzed 896 cases of OCC and OPC based on the Population-based Cancer Registry, 1998–2012. The located occupations were categorized in four risk groups following the classification formulated by the Ministry of Labor. We also analyzed variables smoking and alcohol consumption. **Results:** The highest rates of oral cancer corresponded to occupations associated with cleaning, construction, administration, agriculture and transport. Most occupations, 52.2%, were categorized as risk grade 3. This rate increased to 65.5% when smoking and alcohol consumption were included in analysis. Workers in trade, construction, cleaning services and mechanics accounted for the largest number of OCC and OPC cases in the analyzed municipality. **Conclusion:** We found 131 occupations associated with cases of oral cancer, most of which were categorized as risk grade 3. In consequence, occupational risk should be considered in the planning of preventive actions.

Keywords | occupational exposure; head and neck neoplasms; tobacco.

RESUMO | Introdução: O câncer é uma doença multifatorial e depende de múltiplas etapas. A redução da incidência ou a modificação da evolução da doença se dão pela eliminação dos fatores de risco associados ao câncer. A identificação de fatores de risco para o desenvolvimento de câncer de cabeça e pescoço associados à ocupação profissional pode complementar ações de vigilância desse tipo de câncer e também favorecer a implantação de medidas preventivas nos ambientes de trabalho. **Objetivo:** Identificar as ocupações de pacientes com câncer de cavidade oral (CCO) e de orofaringe (COF) na cidade de Curitiba, Paraná. **Método:** Foi realizado um estudo transversal que avaliou 896 casos de CCO e COF a partir do Registro de Câncer de Base Populacional, entre 1998 e 2012. As ocupações coletadas foram classificadas em quatro grupos baseados no grau de risco definido pelo Ministério do Trabalho e foi analisado o consumo de álcool e tabaco pelos pacientes. **Resultados:** Os grupos ocupacionais associados aos serviços de limpeza e construção, setor administrativo, agricultura e transportes mantiveram as maiores frequências. O grau de risco 3 concentrou o maior número de casos, com 52,2% do total, atingindo 65,5% quando foram avaliados indivíduos com história de consumo de tabaco e álcool. Comércio, construção, limpeza e serviços mecânicos tiveram o maior número de CCO e COF no município estudado. **Conclusão:** Foram encontradas 131 ocupações na amostra estudada, sendo a maior concentração observada no grupo de risco 3. Dessa forma, entende-se que o risco ocupacional deve ser levado em consideração no planejamento de ações preventivas da doença

Palavras-chave | exposição ocupacional; câncer de cabeça e pescoço; tabaco.

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INTRODUCTION

Changes in the Brazilian demographic profile occurred as a result of industrialization, scientific and technological development and urbanization. Within such scenario, the population is continuously adopting new contemporary behaviors and lifestyles, which are associated with considerable exposure to hazards¹. Increasing numbers of people are daily exposed to production products and processes, often without the due scientific knowledge on their effects on human health, their carcinogenic potential in particular².

According to a study performed in Australia, the estimated proportion of occupational cancer is 8 to 16%³. Another study reported that the cases associated with occupational exposure might represent 10.8% of all male cancer patients (excluding non-melanoma skin cancer) and 2.2% of the female patients⁴. These are relative proportions estimated against the risk of the overall population. However, one should consider exposure in the workplace alone, as occupational risk exclusively concerns people who are effectively working and exposed, while its relevance fades away when estimates are made for the overall population³.

Few studies focused on occupational cancer in Brazil, possibly leading to underestimate the actual number of cases. Occupation is not given the same priority as other risk factors, even when the corresponding risk has been well established, as is the case of exposure to coal, benzene, asbestos, high voltage power lines and ionizing radiation, among others³.

The occupational risk factors associated with cancer are very likely to be controlled⁵. For this reason, educational and preventive policies should be incentivized targeting specific occupational groups known to be at high risk.

In regard to oral cancer, 405,000 new cases are expected to occur every year worldwide, 80% of them in developing countries, according to the Jose Alencar Gomes da Silva National Cancer Institute (Instituto Nacional de Câncer José Alencar Gomes da Silva — INCA). In Brazil, 11,140 and 4,350 new cases of oral cavity cancer (OCC) were estimated to occur among men and women, respectively, in 2016–2017. This corresponds to an estimated risk of 11.27 new cases/100,000 men and 4.2 new cases/100,000 women. Few studies assessed occupational risks associated with oral cancer.

Therefore, the aims of the present study were to identify the occupation of patients with OCC or oropharyngeal cancer (OPC) in Curitiba, Parana, Brazil, describe the epidemiological characteristics of the analyzed population and establish high-risk occupations.

METHODS

The present cross-sectional study analyzed secondary data relative to Curitiba residents diagnosed with OCC or OPC (ICD-10-C00 to C14) included in the database of the Epidemiological Surveillance Department, Municipal Secretariat of Health, Curitiba, based on the Curitiba Population-based Cancer Registry (Registro de Câncer Base Populacional de Curitiba — RCBP) which includes data on the incidence of cancer from 1998 to 2012. Records with missing data were excluded, as well as the cases for which we could not collect complementary data. The present study was approved by the research ethics committees of Federal University of Parana (CAAES0150415.7.0000.0102) and the participating institutions and complies with all the established ethical requirements.

Complementary information was collected from medical records at the referral hospitals where the patients received treatment, including: smoking, alcohol consumption, stage disease according to the TNM classification (Union for International Control of Cancer — UICC) and occupational data. Current smokers and those who had quit less than five years earlier were considered as smokers, and the individuals who reported daily consumption of alcohol as drinkers. TNM stages I and II might be rated early, and stages III and IV advanced and with poorer prognosis. Since we could not access the required data for all the institutions included in the database, we only analyzed those corresponding to the main regional cancer referral centers.

The occupations found for the analyzed population were categorized according the classification of risk in economic activities recommended by the Ministry of Labor, Regulatory Standard 04⁶. According to this classification, risk grade 1 corresponds to economic activities with low or mild impact and grade 4 to activities which pose higher risk to the health and safety of workers, including occupational diseases. Risk grades 2 and 3 are intermediate levels.

Thus we were able establish the degree of risk posed by the located occupations.

We performed descriptive analysis of continuous (means) and categorical (absolute and relative frequencies) variables with software IBM Statistical Package for the Social Sciences (SPSS).

RESULTS

RCBP comprises 2,872 records of Curitiba residents diagnosed with OCC or OPC along the analyzed period. A total of 1,396 cases were excluded because we could not access the corresponding medical records to collect complementary information. From the remaining 1,396 cases, only 1,063 described occupational data, however, 167 were cases of “workers who cannot be classified according to occupation,” “unclassified similar technicians and workers,” or “students,” and therefore were also excluded. As a result, the final sample comprised 896 cases, as shown in Table 1.

We identified a total of 131 occupations distributed across the four grades of risk. Following initial analysis, five main groups of occupations encompassed the largest number of cases. The category with the largest number of cases of OCC or OPC was “Employees (hotel employees) and similar workers (housekeepers, butlers, nannies),” 12.9% (115 cases), followed by “agricultural workers,” 9.8% (88 cases) and “masons and plasterers,” 8.9% (80 cases).

The body sites most commonly involved were: floor of the mouth (13.0%), lips (11.7%) and oropharynx and tongue (11.2%). The average age of the patients was 58.7 years old, varying from 51 to 60. Information on cancer staging was available for 201 cases only, 46.5% corresponded to stage IV. Most of the occupations were classified as with risk grade 3 (55%), followed by grade 2 (29%), grade 1 (14%) and grade 4 (2%). Sixty-five percent of the patients in grade 3 occupations were smokers or drinkers.

For individuals who were both smokers and drinkers the oropharynx was the body site most frequently involved, followed by the tongue. Their average age was similar to that of the overall sample, 56.6 years old, and 54% were classified as with stage IV. The most frequent occupations in this group were related to construction (19.9%) and services (8.2%).

For individuals who were either smokers or drinkers, the lips were the most common site of disease (19.6%). Their average age, occupational risk and disease stage were similar to those of the overall sample.

Non-smokers and non-drinkers were older (61 years old) and did not differ in regard to the other analyzed variables.

DISCUSSION

Occupational hazards have been associated with almost all types of malignant neoplasms, including head and neck cancer. This well-known association notwithstanding, very

Table 1. Description of variables according to the Population-based Cancer Registry of Curitiba, 1998 to 2012 (n=1,063).

Risk grade	Patients n (%)	Number of occupations	Sex (%)	Mean age (min-max)	Smoking n (%)	Alcohol n (%)	Tumor staging n (%)	Tumor site n (%)
1	123 (13.7)	31	Female 11 (9)	53 (15-85)	Yes 72 (58)	Yes 48 (39)	IV 30 (25)	Floor of the mouth 30 (18)
			Male 112 (91)		No 27 (22)	No 49 (40)		
2	260 (29)	44	Female 131 (50)	61 (20-98)	Yes 133 (51)	Yes 80 (31)	IV 49 (18)	Lower lip 41 (16)
			Male 129 (50)		No 81 (31)	No 130 (50)		
3	495 (55.2)	48	Female 13 (3)	58 (24-90)	Yes 355 (72)	Yes 190 (38)	IV 132 (27)	Tongue 91 (18)
			Male 482 (97)		No 102 (21)	No 262 (53)		
4	18 (2)	8	Female 0 (0)	60 (45-86)	Yes 15 (83)	Yes 11 (61.1)	III e IV 4 (22)	Floor of the mouth 6 (33)
			Male 18 (100)		No 1 (5)	No 5 (27.7)		

few studies analyzed the occupational exposure of this population of patients. Ours was the first study conducted in the Brazilian South region that had resource to government official data to identify the occupations associated with the largest number of cases of oral cancer.

Most patients with OCC or OPC are diagnosed late, and thus exhibit an advanced stage of disease with considerable morbidity and mortality at the time diagnosis. Also we found this profile in the present study, as 67.6% of the cases were classified as stages III or IV, which points to the need for preventive actions.

The most frequent occupations of patients with OCC or OPC were related to cleaning and maintenance of households, hotels or buildings, administrative work, agricultural work, and trade and transport. History of exposure to risk factors relevant for this type of cancer, such as smoking and alcohol consumption, did not seem to have any relationship with the analyzed variables. The occupations identified in the present study are similar to those reported in the literature^{7,8}.

A study performed in Brazil by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística — IBGE) found correlation between smoking and occupations which do not demand a high educational level but considerable physical effort⁹. Therefore, by combining several etiologic factors, occupations associated with higher levels of risk might potentiate carcinogenesis.

Several studies showed that workers from the poorer economic classes and residing in the periphery of big cities are overexposed to hazards inherent to production processes¹⁰. For instance, Ganesh et al. found that most of the participants in their study on oral cancer were rural workers or non-qualified urban workers, with very low family income and high rates of illiteracy¹¹. Our results point to a similar trend, as the largest number of cases of OCC and OPC corresponded to occupations which do not require much qualification and are usually performed by the less favored population. Bomfim and Cascais analyzed the trends of social security benefits related to OCC and OPC in Brazil and found that the economic activities most often involved were trade, manufacture and administration¹².

The topography of lesions among the patients with history of smoking and/or alcohol consumption corresponded to that widely reported in the literature. In addition, these patients were younger at the time of diagnosis. Disease appeared most frequently on the lips and at an older

age among the patients without history of unhealthy habits. Smoking and drinking seem to accelerate the progression of disease and to reduce its latency period. The number of cases of nasopharyngeal cancer increased, especially among cleaning and maintenance workers.

Cleaning services employ many workers worldwide, who are daily exposed to several chemicals often indoors. In addition to their primary components, cleaning products also form subproducts when in contact with air pollutants and construction materials. One of such is formaldehyde, which is present as primary and secondary product. Disinfectants are considered the most dangerous to health^{13,14}. Some evidence indicates association between exposure to formaldehyde and OCC, OPC¹⁵, nasopharyngeal and hypopharyngeal cancer¹⁶. In the present study, the largest number of cases of nasopharyngeal cancer corresponded to this group of workers.

Also other chemicals with carcinogenic potential are found in common cleaning products, such as benzene-derived polycyclic aromatic hydrocarbons (PAHs). A systematic review found association between incidence of OCC and exposure to PAHs and asbestos¹⁷. Singaravelu e Sellapa¹⁸ reported higher rates of cytogenetic abnormalities in mouth cells of workers exposed to PAHs, which might be related with higher risk of cancer.

Asbestos is also present in construction, an economic activity identified in our study. The pharynx is one of the body sites through which inhaled asbestos fibers travel, and there are clinical and histological similarities between pharyngeal, laryngeal and lung cancer. Many studies reinforce the association between occupational exposure to asbestos and OCC and OPC^{15,17,19}. Association with construction occupations, such as carpenters and painters, was found, even after adjusting the data for smoking and alcohol consumption²⁰. The nasal and oral cells of carpenters — a category which contributed with a large number of cases in our study — might undergo genetic damage due to exposure to wood dust, resulting in high risk of chromosomal instability^{21,22}.

A large number of cases corresponded to agricultural workers. According to official data, 0.2% of the population is involved in agricultural occupations and contribute with 10.6% of the total number of cases of OCC and OPC, with 53 times higher risk²³. Outdoor workers, such as fishermen, farmers and gardeners, are at high risk for lip squamous cell

carcinoma, which is associated with exposure to UV radiation^{7,24-27}. Also agrochemicals (pesticides, herbicides and fungicides) are a part of the occupational exposures of this population of workers²⁸.

In regard to trade and transport, several studies indicate that drivers and street vendors, in addition to mechanics and police officers, are occupationally exposed to PAHs through inhalation of exhaust fumes (gasoline and diesel fuel), oral intake of contaminated dust suspended in the air and direct skin contact, especially within the microenvironment of vehicles, which has been shown to be one of the most contaminated^{29,30}.

Mechanics are also a noteworthy group as concerns occupational hazards. In a study performed in Brazil, Andreotti et al. found that vehicle repair workers exhibited high risk for OCC and OPC independently of age, smoking and alcohol consumption, and that risk increased with prolonged exposure³¹. In addition to PAHs, vehicle mechanics are also exposed to asbestos fibers and glass particles from insulators, welding fumes and soot, heavy mineral oil and strong acid mists, metal and abrasive dust, aldehydes and solvents, among others.

Several literature reviews found that only a small number of studies analyzed risk factors for OCC other than smoking and alcohol consumption²⁷. Since etiology cannot be established for a part of OCC and OPC cases, there is an urgent need to elucidate other possible risk factors. Some evidence points to the contribution of occupational exposures to the occurrence of head and neck cancer³², which significance might have been underestimated¹⁷. Understanding the role of occupational hazards in carcinogenesis might contribute to the formulation and implementation of public

policies for worker protection³¹, as well as to characterize and monitor high-risk populations. These strategies might allow preventing the occurrence of disease⁷ and improving the adequacy of worksites.

Studying occupational risk might be challenging. Records of occupations usually consider the job of workers at the time of the diagnosis, but not their previous occupations, which compromises the reliability of the information on occupational exposure. While in the present study we succeeded in drawing the occupational profile of patients with oral cancer in Curitiba, lack of standardization and aspects inherent to each occupation might have interfered with the interpretation of the results.

CONCLUSION

Workers in occupations related to trade, construction and cleaning, and household, hotel and building maintenance represented the largest number of OCC and OPC cases in the analyzed municipality. The distribution of cases differed when they were analyzed according to variables smoking and alcohol consumption. The most common sites of lesions among smokers and drinkers were the floor of the mouth, oropharynx, base of the tongue and tongue, as is widely reported in the literature. On analysis excluding these unhealthy habits, the lips were the site most commonly involved, and there was a large number of cases of nasopharyngeal lesions. Grade 3 economic activities as per the Ministry of Labor classification were seemingly associated with higher risk of OCC and OPC in Curitiba.

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