

## Oral cancer from a health promotion perspective: experience of a diagnosis network in Ceará\*

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\*Paper presented at the "Equity, Social Inclusion and Oral Health Promotion: Major Challenges" International Symposium, Held at the 18<sup>th</sup> Congress of the Brazilian Association for Oral Health Promotion (*Associação Brasileira de Odontologia de Promoção de Saúde - ABOPREV*), April 2013, Bauru, SP, Brazil.

**Declaration of Interests:** The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

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<http://dx.doi.org/10.1590/1807-3107BOR-2014.vol28.0018>  
Epub R } AH, 2014

Submitted: Nov 24, 2013  
Accepted for publication: Apr 07, 2014  
Last revision: Apr 28, 2014

**Abstract:** The aim of this study is to share the experience of implementing a network for the diagnosis of oral cancer by integrating primary, secondary, and tertiary oral health care centers and identifying the possible weaknesses of the process. The study also investigated the risks of exposure to the main risk factors for oral and lip cancer and their most common potentially malignant lesions (PML). A quantitative cross-sectional study was conducted in two different regions, with patients seen at a primary health care facility from August 2010 to July 2011. Patients with oral lesions were referred to dental specialty centers for biopsy. Patients with PML were treated in dental specialty centers, and patients with squamous cell carcinoma (SCC) were referred to tertiary health care facilities. The dentists' knowledge of PML and SCC was assessed by an objective questionnaire. A total of 3,965 individuals were examined, 296 lesions were found, and 73 biopsies were performed, of which 13.7% were diagnosed as PML and 9.6% as SCC. Tobacco use and sunlight exposure were associated with SCC (85.7%) and PML (80%), respectively. In total, 55 dentists were assessed. The lesions most commonly recognized as PML were leukoplakia (74%), erythroplakia (57%), and actinic cheilosis (56%). Most dentists (74%) felt incapable of performing biopsies, most likely because of an anxiety towards oral cancer, and 57% had never performed one. The integration of primary and secondary health care enables the diagnosis of PML and SCC and establishes a diagnosis network. However, the inability of most primary care dentists to identify PML and perform biopsies is a weakness of the diagnostic process.

**Descriptors:** Carcinoma, Squamous Cell; Mouth Neoplasms; Health Promotion; Diagnosis; Precancerous Conditions.

## Introduction

The term oral cancer refers to tumors of various origins. Approximately 90% are squamous cell carcinoma originating in the oral epithelium.<sup>1</sup> Etiologically, oral squamous cell carcinoma arises from potentially malignant lesions (PML), which are lesions with different malignancy potentials. The lesions that best represent this group are erythroplakias, non-homogeneous leukoplakia, and actinic cheilosis, with malignant transformation rates of 85%, 30%, and 30%, respectively.<sup>2</sup>

In 2012, the *Instituto Nacional de Câncer* - INCA (National Cancer Institute) estimated 14,170 new cases of oral cancer in Brazil, cor-

responding to an estimated risk of 10 new cases per 100 thousand men and 4 new cases per 100 thousand women. In the Brazilian Northeast, oral cancers are the fourth and eighth most common cancers in men and women, respectively, when nonmelanoma skin cancers are excluded.<sup>3</sup>

The main risk factors for oral squamous cell carcinoma are tobacco and alcohol consumption,<sup>3,4,5,6</sup> which are also risk factors for other head and neck malignancies, such as throat and maxillary sinus cancers.<sup>7</sup> However, the risk factors for squamous cell carcinoma of the lip are similar to those of skin cancer, with chronic sunlight exposure being the main risk factor.<sup>8</sup>

Of the risk factors associated with oral squamous cell carcinoma, oral human papillomavirus (HPV) infection has gained great attention. Oral HPV is mainly associated with oropharynx malignancies.<sup>9</sup>

In Brazil, the prognosis of oral cancer is poor.<sup>10</sup> Although the oral cavity can be easily explored visually and tactilely, facilitating the detection of early lesions,<sup>5</sup> the diagnosis of oral cancer, especially squamous cell carcinoma, during the asymptomatic stage is unusual.<sup>1</sup>

Two aspects in particular contribute to the effective diagnosis of oral cancer. First, oral cancer is a preventable disease<sup>10</sup> that is directly associated with potentially malignant lesions<sup>11</sup> in an anatomic region that is easily accessed during physical examination.<sup>12</sup> Second, the national oral health policy included the diagnosis of oral lesions in the scope of practice of primary health care facilities in 2004.<sup>13</sup> Therefore, primary health care professionals should perform preventive oral examinations routinely to detect cancers early, giving patients access to treatment, regardless of diagnosis.

Torres-Pereira *et al.*<sup>14</sup> believe that knowing the risk factors and lesion malignancy potential enables primary, secondary, and tertiary health care professionals to make diagnoses and propose preventive interventions.

Primary health care personnel can promote an awareness of risk factors by developing campaigns and actions that discourage smoking and drinking and encourage the use of lip sunscreen while out-

doors. Secondary health care personnel focus on the early diagnosis of the disease, relying directly on the steady effectiveness of the diagnosis network, which consists of primary health care dentists who examine the patients and refer them to secondary health care experts who work in dental specialty centers. Tertiary health care personnel are responsible for containing the disease and improving the patient's quality of life during their treatment in specialized medical centers.<sup>14</sup>

To improve outcomes, in 2011, the *Ministério da Saúde* - MS (Ministry of Health) launched the *Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica* - PMAQ-AB (National Program for Improving Access to and Quality of Primary Health Care) to guarantee, among other things, a nationally, regionally and locally comparable standard of quality. The PMAQ-AB also included oral mucosal changes in the list of oral health markers, encouraging dentists to search for oral lesions and consequently promoting early cancer diagnosis.<sup>15</sup>

Historically, the lack of early diagnoses for oral malignancies has been associated with difficult access to specialized services, especially for people who live far from state capitals, and with the inability of primary health care providers to make these diagnoses, resulting in low early diagnosis rates. The establishment of a diagnosis network that allows primary health care providers to identify potentially malignant lesions and oral squamous cell carcinoma is an important step towards reducing the number of individuals who only seek specialized services when their oral squamous cell carcinoma is already in an advanced stage.

This study aimed to share the experience of implementing a network for the diagnosis of oral cancer by integrating primary, secondary, and tertiary oral health care centers and identifying the possible weaknesses of the process. In addition, the study also investigated the patients' exposure to the main risk factors for oral and lip cancer and their most common potentially malignant lesions.

## Methodology

A quantitative, cross-sectional study was con-

ducted from August 2010 to July 2011 and comprised individuals from two regional health districts of the state of Ceará covered by the *Estratégia Saúde da Família* - ESF (Family Health Strategy) program. The largest cities in the two regions had approximately 65,000 inhabitants at the time, and approximately 45% of their population benefited from this program. Each regional health district had a dental specialty center. The study population was divided into the following two groups:

- Group 1 consisted of individuals living in the coastal health district, and
- Group 2, of individuals living in the inland health district.

The authors investigated these two populations to compare how sunlight exposure influences the occurrence of PML and oral and lip cancer.

The study enrolled individuals who spontaneously visited a primary health care facility to schedule an appointment with a dentist, agreed to participate in the study, and met at least one of the inclusion criteria. The inclusion criteria were as follows:

- patients aged 40 years or more who consumed tobacco or alcohol,
- had an oral lesion, were frequently exposed to sunlight, and
- had or had had a sexually transmitted disease (STD).

The following data were collected for all patients:

- gender,
- age,
- address,
- presence of risk factors (consumption of tobacco and/or alcohol, sunlight exposure, or history of STD),
- presence or absence of oral lesion, and
- lesion diagnosis.

Clinical examinations were performed by primary health care dentists, who then referred the patients with oral lesions to one of the regional dental specialty centers. Once there, the patients were examined by an expert in stomatology or oral and

maxillofacial surgery, who decided whether a biopsy was necessary. At the dental specialty centers, the patients' sociodemographic and behavioral data, the presence of risk factors, and clinical information about the oral lesions were collected again for confirmation. The tissues obtained by incisional biopsy were fixed in 10% formalin and sent to the Oral Pathology Laboratory of the *Universidade Federal do Ceará - UFC* (Federal University of Ceará's) School of Dentistry for histopathological analysis.

The patients who were diagnosed with potentially malignant lesions were treated and followed up at the dental specialty centers (secondary health care), while the patients who were diagnosed with squamous cell carcinoma were referred to tertiary health care centers for treatment.

Before data collection, an objective questionnaire was administered to the dentists in the Family Health Strategy teams and those working in the dental specialty centers to assess their knowledge about oral cancers and potentially malignant lesions and to determine whether the lack of information could impair the diagnosis of potentially malignant lesions and squamous cell carcinoma. The questionnaire included questions about the dentists' feelings towards patients with oral cancer and reasons for their perceived inability to perform biopsies.

The data were organized using *Epi Info* 3.5.1 software (CDC, Atlanta, USA) and analyzed using GraphPad Prism 5.0 software (GraphPad Software Inc., San Diego, USA) for Windows (Microsoft, New Mexico, USA). The study used the chi-square and Fisher's exact tests to compare the data, setting the significance level at 5% ( $p < 0.05$ ).

All the patients and dentists signed a free and informed consent form. The study was approved by the Research Ethics Committee of the UFC, under protocol number 77/09.

## Results

The primary care facilities included in this study examined 3,965 patients from May 2010 to September 2012. Most of the patients were female (56.4%), 29.6% of the patients were in Group 1 and 70.4% were in Group 2. The dentists found 296 lesions in 7.4% of the patients, with 153 (51.6%) of the le-

**Table 1** - Main risk factors for oral cancer of patients examined by primary health care personnel according to group.

	Group 1	Group 2	
Tobacco	386 (33.3%)	840 (30.3%)	p = 0.066
Alcohol	283 (24.5%)	691 (24.9%)	p = 0.758
Tobacco and alcohol	156 (13.3%)	334 (12.0%)	p = 0.254
STD	19 (1.7%)	25 (0.9%)	p = 0.053
Sunlight	496 (43.3%)	1.602 (59.5%)	p < 0.001*

STD = sexually transmitted diseases; \*p < 0.05 according to the chi-square test. Odds ratio = 1.92 (1.67–2.22). The data are expressed as number and (percentage).

sions being in 13% of the patients of Group 1 and 143 (48.4%) of the lesions in 5.1% of the patients of Group 2.

The prevalence of lesions tended to increase with age, significantly so for males between the first and second decades of life (p < 0.005).

Of the 296 oral lesions found by primary health care dentists, only 73 (24.6%) were biopsied by secondary health care dentists. Most lesions were benign (76.7%), 13.7% were potentially malignant, and 9.6% were oral squamous cell carcinoma. The most common location of all biopsied lesions was the lower lip.

The most common histopathological diagnosis was inflammatory fibrous hyperplasia, accounting for 30 cases (41%). Of these, 8 (28.5%) were possibly associated with HPV and 2 (6.6%) were dysplastic. Actinic cheilosis was the second most common diagnosis (11%), and squamous cell carcinoma corresponded to 9.6% of the biopsied lesions.

Table 1 shows the participants' main risk factors for oral cancer, which differed significantly between the groups (\*p < 0.0001) because more participants in Group 2 (59.5%) were chronically exposed to sunlight.

Ten potentially malignant lesions and seven squamous cell carcinomas were found in the study sample. Table 2 shows the distribution of potentially malignant and malignant lesions according to region.

All potentially malignant lesions were found in participants aged 33 to 54 years, with four in men

**Table 2** - Distribution of potentially malignant lesions and squamous cell carcinomas diagnosed by secondary health care personnel according to group.

	Group 1	Group 2	
Potentially malignant lesions	6 (0.5%)	4 (0.1%)	p = 0.044*
Squamous cell carcinomas	1 (0.1%)	6 (0.2%)	p = 0.337

\*p < 0.05 according to the Fisher's exact test. Odds ratio = 3.57 (1.90–15.05). The data are expressed as number and (percentage).

and 6 in women. Eight potentially malignant lesions were in the lower lip, one was in the buccal mucosa, and one was in the alveolar ridge.

Squamous cell carcinomas were found in individuals aged 59 to 85 years, of which 3 were men and 4 were women. Again, the lower lip was the most common site (57.1%). Other sites included the lateral border of the tongue, hard palate, and buccal mucosa, with one lesion each.

Most (85.7%) patients diagnosed with squamous cell carcinoma were smokers, and 80% of those with potentially malignant lesions were exposed to sunlight daily. Table 3 shows the participants' main risk factors.

A total of 55 dentists participated in the study on the knowledge of dentists about potentially malignant lesions and squamous cell carcinoma. Of these, 42 were members of the Family Health Strategy teams and 9 worked at the dental specialty centers. Information about working place was absent in four questionnaires. Thirty-two dentists were in Group 1 and 23 in Group 2. The professionals had 4 months to 42 years of practice, with a mean of 6.37 years.

Approximately half (53%) of the dentists had already seen patients with oral squamous cell carcinoma, and most (83%) had seen patients with possibly potentially malignant lesions. Table 4 shows the dentists' answers to the questionnaire.

## Discussion

The presence of oral lesions in 296 (7.4%) patients stresses the importance of primary health care personnel performing complete oral examinations, including teeth, soft tissues, bones, and adjacent

**Table 3** - Exposure of patients with potentially malignant lesions and squamous cell carcinoma diagnosed by secondary health care personnel to the risk factors for oral cancer.

	Risk factor	Cases	Control	
Squamous cell carcinoma	Tobacco	6 (0.48%)	1 (0.03%)	$p = 0.004^*$
	Alcohol	2 (0.20%)	5 (0.17%)	$p = 0.686$
	Tobacco and alcohol	2 (0.40%)	5 (0.14%)	$p = 0.210$
	STD	1 (2.32%)	5 (0.13%)	$p = 0.067$
	Sunlight	5 (0.24%)	2 (0.11%)	$p = 0.467$
Potentially malignant lesions	Tobacco	1 (0.08%)	9 (0.42%)	$p = 0.188$
	Alcohol	2 (0.20%)	7 (0.23%)	$p = 1.000$
	Tobacco and alcohol	0 (0.00%)	10 (0.28%)	$p = 0.623$
	STD	0 (0.00%)	9 (0.24%)	$p = 1.000$
	Sunlight	8 (0.38%)	2 (0.11%)	$p = 0.124$

STD = sexually transmitted diseases; \* $p < 0.05$  according to Fisher's exact test. Odds ratio = 13.27 (1.60–294.63). The data are expressed as number and (percentage).

structures, because this is the only way individuals gain access to higher levels of care. The great difference in size between Groups 1 and 2 reflect one of the main difficulties regarding public policies for oral cancer. Specifically, in the absence of political and governmental control, diagnosis, prevention, and treatment depend entirely on the individual actions of the professionals involved.<sup>14</sup> In the present study, for example, it was observed that the professionals in Group 2 were more involved with the prevention of oral lesions than those in Group 1, which can explain the difference in size between the two groups. Moreover, the number of biopsies performed by secondary health care centers was very low compared with the great number of lesions identified by primary health care centers, revealing a weakness in the diagnostic process because most of the lesions were in fact developmental defects of the oral and maxillofacial region.

Potentially malignant lesions were more prevalent in Group 1 (60%), but this group also had more dentists capable of recognizing leukoplakia, erythroplakia, and actinic cheilosis as potentially malignant lesions and of identifying the main characteristics of an early malignant lesion, namely, a painless, indurated ulcer with rolled edges. Thus, knowledge about potentially malignant lesions was positively associated with their identification, contributing to the prevention of squamous cell carcinoma, given that the treatment of potentially malignant lesions

may prevent the development of malignant lesions.<sup>5</sup> Additionally, the lack of knowledge about potentially malignant lesions may be noted as a weakness of the diagnosis network.

Sunlight was the most prevalent risk factor in both study regions, and Group 2 (59.5%) was significantly more exposed than Group 1 ( $p < 0.001$ ). Sunlight was also the most and second-most common risk factor among individuals with potentially malignant (71.4%) and malignant lesions (80%), respectively. This reinforces the National Oral Health Policy's recommendation for knowing the most prevalent diseases in a region, as this allows the development of region-specific oral health practices that are effective and curative. Actions to prevent sunlight-related squamous cell carcinoma of the lip are as important as those directed towards tobacco and alcohol consumption, which increase the risk of oral squamous cell carcinoma by 5.49 and 4.62 times, respectively.<sup>16</sup>

The percentage of malignant lesions (9.4%) found by the present study was similar to those found by other studies conducted in the Brazilian Northeast.<sup>17</sup> An exception was the predominance of lip cancer (57.1%) over intraoral cancer, which was most likely due to the large number of study participants who were exposed daily to ultraviolet radiation.

All lip carcinomas were associated with chronic sunlight exposure, the established and recognized main risk factor for lip cancer.<sup>4</sup> Unlike the associa-

**Table 4** - Dentists' knowledge of potentially malignant lesions, feelings towards patients with oral cancer, and reasons for their perceived inability to perform biopsies by group.

Knowledge of potentially malignant lesions						
Which of these lesions are considered potentially malignant?	n	%	Group 1	Group 2	p-value*	OR
Leukoplakia	40	74.1%	21 (67.7%)	14 (60.9%)	0.6010	-
Erythroplakia	31	57.4%	16 (51.6%)	12 (52.2%)	0.9674	-
Actinic cheilosis	30	55.6%	17 (54.8%)	11 (47.8%)	0.6100	-
Angular cheilitis	11	20.4%	7 (22.6%)	3 (13.0%)	0.4886	-
Lichen planus	08	14.0%	5 (16.1%)	3 (13.0%)	1.0000	-
Inflammatory fibrous hyperplasia	07	13.0%	6 (19.4%)	1 (4.3%)	0.2178	-
Candidiasis	02	3.7%	1 (3.2%)	1 (4.3%)	1.0000	-
Aphthous ulcers	01	1.9%	1 (3.2%)	0 (0.0%)	1.0000	-
I do not know	03	5.6%	2 (6.5%)	1 (4.3%)	1.0000	-
Feelings towards patients with oral cancer						
What do you feel when you see a patient with oral cancer?	n	%	Group 1	Group 2	p-value*	OR
Anxiety	32	59.3%	21 (67.7%)	10 (43.5%)	0.0745	-
Fear	02	3.7%	0 (0.0%)	2 (8.7%)	0.1767	-
Pity	16	29.6%	0 (0.0%)	5 (21.7%)*	0.0106	- †
Prejudice	01	1.9%	7 (22.6%)	1 (4.3%)	0.1186	-
Oral biopsies						
	n	%	Group 1	Group 2	p-value*	OR
Does not perform biopsies	40	74.1%	24 (77.4%)	14 (60.9%)	0.1878	-
Reasons not to perform a biopsy						
Lack of technical knowledge	10	18.5%	9 (29.0%)*	1 (4.3%)	0.0318	9.0 (1.0 - 206.0)
Has never performed one	31	57.4%	20 (64.5%)	11 (47.8%)	0.2200	-
Fear of erring	-	-	-	-	-	-
Fear of uncontrolled bleeding	4	7.4%	2 (6.5%)	2 (8.7%)	1.0000	-

\*p < 0.05. † Not possible to determine the odds ratio.

tion between sunlight and skin cancer, the association between sunlight and lip cancer is unknown to most, contributing to people's negligence towards their lips.<sup>8</sup>

The dentists surveyed in this study believed that smokers are at the highest risk of oral cancer. Accordingly, smoking was the only factor significantly associated with oral cancer (p = 0.004). Squamous cell carcinoma was 13.27 times more common in smokers. The concomitant use of alcohol and tobacco, observed in 12.3% of the individuals of Groups 1 and 2, increases the risk of oral squamous cell carcinoma. Accordingly, 74.3% of the study partici-

pants diagnosed with squamous cell carcinoma were tobacco and alcohol consumers. Education actions are needed to increase the awareness of these associations and to encourage individuals to give up habits involved in the pathogenesis of oral cancer.<sup>18</sup>

Although the National Oral Health Policy included the diagnosis of oral lesions, with special emphasis on oral cancer,<sup>13</sup> in the scope of practice of primary health care facilities in 2004, and the PMAQ-AB launched in 2011<sup>15</sup> included an indicator of the incidence of mucosal changes, primary health care dentists still have little knowledge of stomatology. For example, most dentists (74.1%) considered

themselves incapable of performing biopsies, which are essential for the early diagnosis of oral lesions.

Public health managers have proposed many actions to prevent oral cancer, but few are based on scientific evidence that can actually decrease its incidence or promote its early diagnosis. In 2006, the state of Ceará launched a public policy to reduce the incidence of oral cancer that was approved by the State Board of Health. The policy lists actions to be implemented by the state to fight oral cancer. However, at present, there is no scientific evidence that any policy, anywhere in the world, has been capable of reducing the incidence of oral cancer.<sup>7</sup>

The diagnoses of potentially malignant and malignant oral lesions in the sample reflect the successful integration of primary and secondary health care. However, as unprepared primary care professionals were incapable of providing diagnoses and performing biopsies, all the biopsies were performed at secondary health care facilities. The existence of regional dental specialty centers in Ceará reduces the distance barrier between patient and medical care, increasing access to treatment. The lack of experts in other Brazilian states has already been described as a difficulty in the early diagnosis of oral cancer.<sup>19</sup>

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## Conclusion

The early diagnosis of potentially malignant lesions and squamous cell carcinoma is promoted by integrating primary and secondary health care, forming a diagnosis network. However, most primary care dentists were incapable of identifying potentially malignant lesions and performing biopsies, most likely because of their anxiety towards oral cancer, which may be a weakness in the diagnostic process.

The present study found a few challenges and possibilities associated with the implementation of an oral cancer diagnosis network. The integration of dentists' knowledge of oral lesions and risk factors for oral cancer, region-specific preventive policies, and integration of primary, secondary, and tertiary care may actually reduce the incidence of oral cancer.

## Acknowledgments

The authors certify that they have no conflicts of interest. This study was sponsored by the *Programa Pesquisa para o Sistema Único de Saúde (PPSUS/2009)* (Brazilian Unified Health Care System Research Program) under protocol number 09100058-0/09.

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