

Assessment of oral cancer awareness among dentists in Tunisia: A cross-sectional study

Évaluation des connaissances et des pratiques des Médecins dentistes vis-a-vis du cancer buccal en Tunisie : Une étude transversale

Sahar Kadri¹, Afef Slim², Amira Besbes², Marwa Garma², Hajer Hentati², Jamil Selmi²

1. Department of dentistry, University Hospital of Farhat Hached, Research Laboratory LR 12SP10: Functional and Aesthetic Rehabilitation of Maxillary, University of Sousse, Sousse, Tunisia, Faculty of Dental Medicine, University of Monastir, Monastir, Tunisia
2. Department of Oral Surgery, University of Dental Medicine, Faculty of Dental Medicine, University of Monastir, Monastir, Tunisia

ABSTRACT

Introduction: Oral cancer is an increasing global health problem, and its early diagnosis is of great importance. Worldwide, several studies have assessed dentists' knowledge and practices regarding oral cancer. However, there is a lack of available data on this subject in Tunisia.

Aim: This study aimed to assess knowledge, attitudes, and practices related to oral cancer among dentists in Tunisia.

Methods: This was a cross-sectional study. A structured questionnaire was distributed to 350 dentists (255 females, 72.9%; 95 males, 27.1%) practicing in both public and private sectors across different regions of Tunisia. The mean age of participants was 30 years (range: 24–49), and their professional experience varied from less than 5 years to more than 20 years. Dentists' knowledge about risk factors and clinical presentations of oral cancer development, and their current practices were assessed. Associations between knowledge levels and sex, seniority, specialty, type of practice, and sources of information were examined using the χ^2 test and Fisher's exact test.

Results: The majority of participants identified tobacco (93.4%) and alcohol consumption (45.4%) as major risk factors for oral cancer. Oral medicine university specialists aged under 40 years had the best scores in identifying the floor of the mouth as the most common site for oral cancer, erythroplakia and leukoplakia as the most likely potentially malignant lesions, and squamous cell carcinoma as the most common histological type.

Conclusion: Dentists have a crucial role in the early detection of oral cancer. This study revealed important gaps in Tunisian dentists' knowledge, particularly regarding risk factors beyond tobacco and alcohol, and highlighted the need to strengthen educational strategies for oral cancer detection and prevention.

Keywords: Dentists; Early Detection of Cancer; Health Knowledge, Attitudes, Practice; Mouth Neoplasms; Oral Potentially Malignant Disorders; Preventive Dentistry.

RÉSUMÉ

Introduction: Le cancer buccal constitue un problème majeur de santé publique, et son diagnostic précoce revêt une importance capitale. Des études internationales ont évalué les connaissances et les pratiques des médecins-dentistes à ce sujet. Cependant, les données restent limitées en Tunisie.

Objectifs: Cette étude visait à évaluer les connaissances, attitudes et pratiques des médecins-dentistes tunisiens concernant le cancer buccal.

Méthodes: Il s'agit d'une étude transversale menée auprès de 350 médecins-dentistes tunisiens (255 femmes, 72,9% ; 95 hommes, 27,1%), exerçant dans les secteurs public et privé et répartis sur plusieurs régions du pays. L'âge moyen des participants était de 30 ans (écart: 24–49), et leur ancienneté variait de moins de 5 ans à plus de 20 ans. Leurs connaissances sur les facteurs de risque et les manifestations cliniques du cancer buccal ainsi que leurs pratiques ont été évaluées. L'étude des associations entre le niveau de connaissance et le sexe, l'ancienneté, la spécialité, le type de pratique et les sources d'information a été réalisée en appliquant les tests χ^2 et exact de Fisher.

Résultats: La majorité des participants a identifié le tabac (93,4%) et la consommation d'alcool (45,4%) comme principaux facteurs de risque du cancer buccal. Les universitaires en médecine buccale âgés de moins de 40 ans ont obtenu les meilleurs scores dans l'identification du plancher buccal comme étant le site le plus fréquemment atteint du cancer buccal, l'érythroplasie et la leucoplasie comme lésions potentiellement malignes, et le carcinome épidermoïde comme étant le type histologique le plus fréquent.

Conclusion: Les médecins-dentistes jouent un rôle essentiel dans le dépistage précoce du cancer buccal. Cette étude a mis en évidence d'importantes lacunes dans leurs connaissances, notamment au sujet des facteurs de risque autres que le tabac et l'alcool, et souligne la nécessité de renforcer les stratégies pédagogiques pour la détection et la prévention du cancer buccal.

Keywords: Chirurgiens-dentistes ; Détection précoce du cancer ; Connaissances, attitudes et pratiques en santé ; Tumeurs buccales ; Troubles oraux potentiellement malins ; Dentisterie préventive

Correspondance

Sahar kadri

Department of dentistry, University Hospital of Farhat Hached, Research Laboratory LR 12SP10: Functional and Aesthetic Rehabilitation of Maxillary, University of Sousse, Sousse, Tunisia, Faculty of Dental Medicine, University of Monastir, Monastir, Tunisia

Email: dr.kadrisahar@gmail.com

INTRODUCTION

Oral and oropharyngeal cancers are among the most prevalent malignancies worldwide. According to the World Cancer Report 2014, they are ranked as the seventh most common cancers globally and the ninth leading cause of cancer-related deaths by site [1]. More than 90% of oral cancers are oral squamous cell carcinoma (OSCC), a malignancy originating from the oral epithelium [2]. The 5-year survival rate for OSCC decreases dramatically, from approximately 85% in early stages (I and II) to about 40% in advanced stages (III and IV) [3]. Despite the accessibility of the oral cavity for clinical examination, malignant lesions are often misdiagnosed or diagnosed late. The WHO Cancer Report (2014) highlighted that while the 1-year survival rate for oral and pharyngeal carcinoma is 84%, this rate drops to 62% at 5 years and 51% at 10 years [4]. Early detection is therefore essential to improve survival outcomes. Dentists play a crucial role in this process by conducting thorough examinations of the oral mucosa to identify malignant and potentially malignant lesions, particularly in high-risk areas such as the lateral border of the tongue and the floor of the mouth [5, 6]. A sound understanding of risk factors - including tobacco use, excessive alcohol consumption, ultraviolet radiation exposure, prior OSCC history, advanced age, and poor nutrition - is necessary to enhance awareness and facilitate early detection. Such efforts contribute to improving patients' quality of life, reducing treatment costs, and lowering morbidity and mortality rates [4, 7, 8].

Nevertheless, studies conducted in Europe, North America, Australia, Malaysia, and the Middle East have consistently demonstrated gaps in dentists' knowledge regarding OSCC risk factors, clinical presentation, diagnostic procedures, and referral practices for potentially malignant lesions [6, 9-15]. These findings emphasize the global need for improved education and training in order to strengthen the prevention, early detection, and referral of OSCC cases [7, 16, 17]. However, data on this subject remain scarce in several regions, particularly in North Africa.

Given this lack of information, the present study aimed to assess Tunisian dentists' knowledge, attitudes, and practices regarding oral cancer. By identifying existing gaps, this research seeks to contribute to the development of targeted educational strategies and preventive measures that can ultimately improve oral cancer detection and patient outcomes.

METHODS

A descriptive, cross-sectional study was conducted from January to May 2024 in Tunisia. The study group included general dentists and specialists graduated from the dental medicine faculty, university of Monastir in Tunisia. The list of participating doctors included general dentists working in public dental clinics, specialists practicing in university hospitals and dentists working in their private dental clinics from different governments of Tunisia.

Dentists who had foreign diplomas were not included in this study.

According to the 2021 health map of Tunisia, the population of dentists was estimated at 4,400 practitioners [18]. The sample size was calculated using Cochran's formula for proportions [7,19]:

$$n_0 = \frac{Z^2 p \cdot (1 - p)}{E^2}$$

where Z is the standard normal value corresponding to the desired confidence level (1.96 for 95%), p is the expected proportion (set at 0.50 to yield the maximum sample size), and

E is the margin of error (0.05). This yielded an initial sample size of $n_0 = 384$.

Since the total population was finite (N= 4,400), the finite population correction was applied:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

resulting in a required minimum sample size of 354 dentists. To account for an anticipated 10% nonresponse rate, the number was adjusted as follows:

$$n_{invited} = \frac{n}{1 - r}$$

where r is the expected nonresponse (0.10). This gave a final target of 393 dentists to be invited, in order to ensure at least 354 completed responses with the desired precision. After calculation, the number of dentists required for the study was 393.

To recruit participants, a convenience sampling method with regional stratification was employed to ensure representativeness. Invitations were distributed via professional dental associations, official email lists, and social media groups dedicated to Tunisian dentists. Participation was voluntary, and eligible dentists were those actively practicing in Tunisia at the time of the study. To ensure diversity and representativeness, dentists from different governorates, including both urban and rural areas, various age groups, genders, as well as various specialties and levels of professional experience, were targeted. This strategy aimed to capture a broad spectrum of knowledge, attitudes, and practices regarding oral cancer. This approach ensures that the sample reflects the demographic and professional diversity of the Tunisian dental population, providing reliable and generalizable insights into dentists' knowledge, attitudes, and practices regarding oral cancer.

Data collection

A self-administered questionnaire was created on Google Forms based on questionnaire of a previous study of Özge Kebabcioğlu et al [20].

The survey link was disseminated via email, private Facebook groups, Messenger messages, and Instagram messages to 370 practicing dentists in Tunisia from our database .

The survey remained accessible online for 5 months, after which the data were analyzed.

The questionnaire was made of 26 questions and divided into six sections:

- The first one included six questions regarding the participants' socio-demographic data;
- The second section included a question about their knowledge about oral cancer risk factors;
- The third section was made of five questions about their knowledge about oral cancer diagnostic procedures;
- The fourth section included six questions documenting their attitude towards oral cancer
- The fifth section included six questions concerning the patient's health history assessment by the respondents.
- Whilst the sixth and last section questioned about the information sources of the respondents through two questions.

Data analyses

The statistical analysis of the questionnaire was performed using data accumulation and analysis package IBM SPSS Statistics 25 program (Statistical Package for Social Science). The results were expressed as a percentage with a confidence interval of 95%. Descriptive statistical methods (mean, standard deviation, and frequency) were used for the evaluation of the data.

Chi-square test and Fisher's exact test were used to evaluate the comparison of categorical data. p-value of less than 0,05 was interpreted as statistically significant.

Ethical consideration

This study was a part of a project assessing the oral cancer knowledge among Tunisian dentists utilizing an online survey questionnaire. This questionnaire was elaborated from previous studies contributed all over the world for the same objectives [20-22].

Ethical approval for this study was obtained from the committee of Dental medicine under the number 2025017. The approval reference is provided in Appendix 2. All participants provided informed consent prior to participation,

All the participants were enrolled voluntarily in the study with no direct benefits. They were informed that the survey was completely anonymous, as indicated in the accompanying cover letter. The completion of the questionnaire by each participant was considered as a form of individual consent to contribute to this study and the study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

A total of all 393 dentists participated to the questionnaire. After the data collection and exclusion of dentists holding a foreign diploma, only 350 dentists were ultimately included in the final analysis of the study which accounted for a response rate of 90%. They were

from 6 different training specialties (Figure. 1).

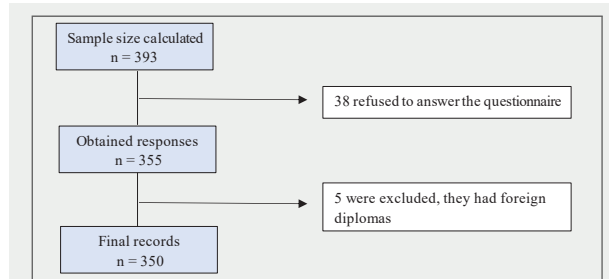


Figure 1. Flowchart describing the sample size

Characteristics of the study participants

The responses about demographic and practice characteristics are listed in Table 1. Among 350 participants, there were 95 (27.1%) male dentists and 255 (72.9%) female dentists. Nearly two thirds were between 24 and 29 years old. Sixty-six percent were in general practice. Whereas nearly the half was working as a university member. Overall, 99.7% were Tunisian and one dentist was a foreigner (Table 1).

Table 1. The participants' socio-demographic characteristics of the population

		n	%
Sex	Female	255	72.9
	Male	95	27.1
Age	24-29	214	61.1
	30-39	122	34.9
	40-49	14	4
Different specialties	General dentistry	231	66
	Oral medicine and oral surgery	48	13.7
	Prosthodontics	24	6.9
	Pediatric Dentistry	6	1.7
	Periodontics	1	0.3
	Orthodontics	5	1.4
	Restorative dentistry	11	3.1
	Undefined	24	6.9
Nationality	Tunisian	349	99.7
	Other	1	0.3
Type of practice	Hospital university member	159	45.4
	Sanitary sector	40	11.4
	Private practice	151	43.1

Knowledge of risk factors for oral cancer

Most participants identified tobacco (93.4%) and abusive consumption of alcohol (45.4%) as risk factors for oral cancer. A lower percentage of dentists identified the genetic predisposition (9.5%) and the viral infections (8.3%) as secondary risk factors.

Knowledge of the clinical diagnosis for oral cancer

The tongue and the Mucous membrane were listed by 34.3% of dentists and the floor of the mouth was identified by 30.6% of them (Figure. 2).

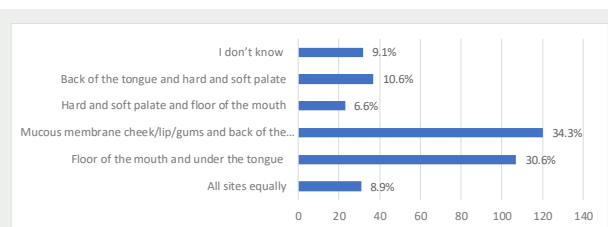


Figure 2. Knowledge about the most common sites for oral cancer

Leukoplakia and erythroplakia were considered as the most common oral potentially malignant lesions, listed by 74.9% of the dentists. Blue nevus and leukoplakia were listed by 6% and 4% of the responders.

Forty-eight percent of the questioned dentists identified the squamous cell carcinoma as the most common form of oral cancer. However, an important number of them (24.3%) didn't know the answer (Figure. 3).

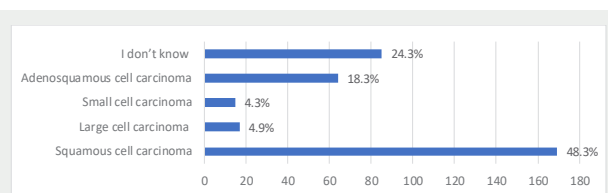


Figure 3. Knowledge about the most common form of oral cancer

Thirty-three percent of the participants indicated small, painless, white lesion as prior oral cancer lesion whereas 26.9% of them indicated small, painless, red lesion as prior oral cancer lesion (Figure 4).

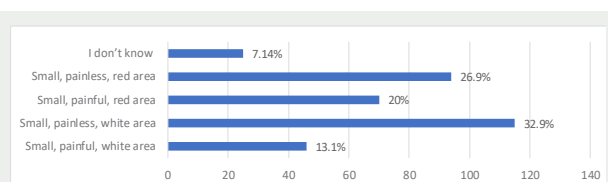


Figure 4. Knowledge about clinical properties of a prior oral cancer lesion

Above the half of the dentists (56.6%) agreed that the age group more likely to be diagnosed with oral cancer was those aged between 40 and 60 years. A smaller group (34.9%) chose the age group 60 – 80 years.

Dentists attitude towards oral cancer

A total of 68% of respondents strongly agreed to advise their patients presented with suspicious lesions. When dentists were asked whether they were adequately trained, 28.7% and 49.4%, respectively, believed that they were comfortable performing an oral cancer examination and palpating lymph nodes in patients' necks. On the other hand, 34% of respondents disagreed that their patients sufficiently know signs and symptoms of oral cancer.

Most dentists reported asking about the patient's current use of tobacco (97.4%), current use of alcohol (88%), history of cancer (87.4%), and patient's previous use of tobacco (85.4%). The percentage of dentists asking about

patient's previous use of alcohol was 75.1%. However, only two thirds (63.4%) of the respondents reported asking about the patient's family history of cancer.

Dentists' sources of information

Questions concerning sources of information indicated that the respondents learned about prevention of oral cancer from educational courses (86.6%), dental congresses (53.7%), scientific journals (28.9%) and textbooks (1.2%).

Sixty-three percent of the questioned dentists strongly agreed on wishing to have more educational courses about oral cancer diagnosis.

In multivariate analysis, data showed that:

- Dentists who are less than 40 years old scored marginally higher in indicating patients between 40-60 years as the most aged group to be diagnosed with oral cancer ($p=0.03$) and they had the most adequate attitude against oral cancer ($p= 0.03$) compared to those who aged more than 40 years.
- In addition, oral surgeons scored marginally higher in mentioning floor of the mouth and under the tongue as the most common sites for oral cancer ($p<0.01$), they also chose squamous cell carcinoma as the most common form of oral cancer ($p<0.01$) in comparison with the other specialties.
- Hospital university members had the most adequate attitude against oral cancer ($p= 0.01$) in comparison with dentists practicing in the private sector.
- Finally, dentists who had scientific journals as their first source of information, scored higher in mentioning tobacco and alcohol as the most risk factors for oral cancer ($p= 0.04$) and the squamous cell carcinoma as the most common form of oral cancer ($p= 0.03$) and had also the most adequate attitude against oral cancer ($p<0.01$).

DISCUSSION

Mouth and oral cancer rank are considered as the 16th most common cancers globally, placing 12th among men and 18th among women. They represent the most prevalent form of head and neck cancer and are the ninth deadliest cancer by site worldwide in terms of mortality [23,24].

Detecting oral cancer at an early stage remains a significant challenge for physicians and dentists. Early prevention and diagnosis require the ability to conduct thorough clinical examinations to identify malignant or premalignant oral lesions.

The present study highlighted that a considerable number of Tunisian dentists have insufficient knowledge and experience regarding oral cancers, especially in recognizing early lesions. This finding aligns with global reports indicating that dentists often fail to detect early oral squamous cell carcinoma (OSCC) due to lack of awareness or inadequate training [20, 25, 26].

Table 2. Dentists' knowledge assessment of oral cancer according to their gender, seniority, specialties, type of practice and source of information

		Alcohol and tobacco n (%)	p	Most common site n (%)	p	Leukoplakia and erythroplakia n (%)	P	Squamous cell carcinoma n (%)	p	Most aged group diagnosed n (%)	p	Prior oral cancer lesion n (%)	p	Correct dentists' attitudes n (%)	p
Gender	Male	80 (84.2%)	0.223	28 (29.5%)	0.786	68 (71.6%)	0.388	45 (47.4%)	0.834	49 (51.9%)	0.25	55 (57.9%)	0.672	76 (80%)	0.062
	Female	227 (89%)		79 (31%)		194 (76.1%)		124 (48.6%)		149 (58.4%)		154 (60.4%)		224 (87.8%)	
Age	<40	297 (88.4%)	0.079	103 (30.7%)	1	252 (75%)	0.757	164 (48.8%)	0.337	194 (57.7%)	0.031	199 (59.2%)	0.362	291 (86.6%)	0.036
	>=40	10 (71.4%)		4 (28.6%)		10 (71.4%)		5 (35.7%)		4 (28.6%)		10 (71.4%)		9 (64.3%)	
Specialty	General dentistry	206 (89.2%)	0.245	57 (24.7%)	0.001	170 (73.6%)	0.448	98 (42.4%)	0.002	127 (55%)	0.402	132 (57.1%)	0.172	193 (85.5%)	0.107
	Oral surgery	41 (85.4%)	0.602	27 (56.3%)	< 0.001	41 (85.4%)	0.069	42 (87.5%)	< 0.001	20 (41.7%)	0.791	34 (70.8%)	0.091	45 (93.8%)	0.084
	Restorative dentistry	11 (100%)	0.372	1 (9.1%)	0.183	6 (54.5%)	0.153	3 (27.3%)	0.156	7 (63.6%)	0.762	7 (63.6%)	1	7 (63.6%)	0.057
Type of practice	Orthodontist	5 (100%)	1	1 (20%)	1	3 (60%)	0.603	2 (40%)	1	3 (60%)	1	4 (80%)	0.652	4 (80%)	0.540
	Pedodontist	4 (66.7%)	0.161	3 (50%)	0.375	5 (83.3%)	1	3 (50%)	1	3 (50%)	1	4 (66.7%)	1	4 (66.7%)	0.206
	Prosthodontist	19 (79.2%)	0.195	9 (37.5%)	0.445	18 (75%)	0.987	9 (37.5%)	0.273	16 (66.7%)	0.301	17 (70.8%)	0.25	24 (100%)	0.033
Oral cancer information sources	Sanitary sector	36 (90%)	0.801	11 (27.5%)	0.654	30 (75%)	0.982	19 (47.5%)	0.916	21 (52.5%)	0.581	19 (47.5%)	0.094	35 (87.5%)	0.732
	Private practice	132 (87.4%)	0.883	40 (26.5%)	0.149	114 (75.5%)	0.81	65 (43%)	0.088	81 (53.6%)	0.336	95 (62.9%)	0.288	121 (80.1%)	0.009
	Hospital university member	139 (87.4%)	0.879	56 (35.2%)	0.085	118 (74.2%)	0.8	85 (53.5%)	0.077	96 (60.4%)	0.19	95 (59.7%)	0.991	144 (90.6%)	0.018
Oral cancer information sources	Educational courses	268 (88.4%)	0.288	95 (31.4%)	0.42	228 (75.2%)	0.669	140 (46.2%)	0.048	168 (55.4%)	0.281	180 (59.4%)	0.765	259 (85.5%)	0.749
	Scientific journals	83 (82.2%)	0.044	36 (35.6%)	0.19	76 (75.2%)	0.915	74 (73.3%)	< 0.001	60 (59.4%)	0.496	66 (65.3%)	0.171	93 (92.1%)	0.03
	Textbooks	25 (78.1%)	0.092	10 (31.3%)	0.93	26 (81.3%)	0.382	21 (65.6%)	0.039	13 (40.6%)	0.056	23 (71.3%)	0.141	31 (96.9%)	0.064
	Dental congresses	165 (87.8%)	0.975	63 (33.5%)	0.199	154 (81.9%)	0.001	98 (52.1%)	0.121	98 (52.1%)	0.071	117 (62.2%)	0.3	163 (86.7%)	0.569

Chi-square (χ^2) test was used for the cells where $n \geq 5$; Fisher's exact test was used for the cells where $n < 5$; $p < 0.05$ was interpreted as significant

Early detection is crucial because the 5-year survival rate for OSCC dramatically decreases from 85% in early stages to 40% in advanced stages [3], emphasizing the critical role of dentists in oral cancer screening.

Dentists' knowledge of risk factors

In our study, the majority of dentists correctly identified tobacco (93.4%) and alcohol consumption (45.4%) as the main risk factors for oral cancer. Colella et al. [25], similarly reported that 94.1% of dentists recognized tobacco use, 79.2% recognized alcohol consumption, and 89.5% identified a prior oral cancer lesion as major risk factors. Similar results have also been documented in studies conducted in Turkey [20], Kuwait [27], India [26], and Yemen [28], confirming that tobacco and alcohol remain the most widely acknowledged etiological factors. Beyond these classic determinants, most respondents in our study also demonstrated awareness of other established risks, such as genetic predisposition, viral infections, UV exposure, and a history of oral cancer lesions. However, only a minority recognized poor oral hygiene, low fruit consumption, and older age as additional risk factors, despite their reported associations with increased oral cancer incidence. This gap may indicate that while dentists are well informed about the "major" risk factors emphasized in curricula, they may be less familiar with secondary or emerging determinants. Indeed, recent literature underscores the

role of HPV infection, immunodeficiency conditions, and low socioeconomic status as important contributors to oral carcinogenesis.

These differences can be explained by the ethnic and genetic reasons and the different dietary habits and lifestyle.

Knowledge of cancer sites and forms

The fact that Tunisian dentists most frequently identified the floor of the mouth and the tongue as the sites most at risk for oral cancer (34.3%) is in line with findings from Turkey [20], Kuwait [27], and Yemen [28]. This concordance may be explained by the well-established epidemiological reality that these anatomical locations are particularly vulnerable due to their thin mucosa, rich vascularization, and direct exposure to carcinogens such as tobacco and alcohol. Moreover, international literature consistently describes the floor of the mouth and tongue as the primary sites of oral cancer, and this information is strongly emphasized in dental education programs across these regions. Finally, the prevalence of regional risk factors and the clinical experience of practitioners may reinforce this awareness and explain the similarity in findings across different Middle Eastern and North African contexts."

In India and elsewhere, cancer of the tongue is the leading site not only among oral cancers but also among head and neck cancers [26]. This predominance is largely

attributed to the widespread use of smokeless tobacco, betel quid, and areca nut, which expose the lateral tongue to carcinogens through direct and repeated contact. These findings highlight how regional lifestyle habits and risk factor prevalence shape the epidemiology of oral cancer sites.

Awareness of premalignant lesions

Additionally, 32.6% of the respondents considered small, painless, white lesion as the clinical properties of oral cancer whereas only 26.9% of the respondents considered small, painless, red lesion as the clinical properties of oral cancer. Same results were found in Ozge. K's study with respectively 35.9% and 26.5% [20]. In India, most of the dentists (82%) considered white lesions as the most common observed oral cancer lesion and only 9.6% of dentists considered red erosions as the most common seen oral cancer lesion [26]. In another study, Clovis et al. [29] observed that the appearance of early oral cancer lesions (small, painless, red lesions) was mostly identified by most of the respondents (77%). The discrepancy between our findings and those of Clovis et al. may reflect differences in educational emphasis and clinical exposure. Epidemiological variations in risk factors and the spectrum of lesions observed in different populations may also account for this divergence.

Leukoplakia, the most common potentially malignant lesion of oral mucosa is defined as a white patch or plaque that could not be characterized clinically or pathologically as any other disease by World Health Organization (WHO). In cases of leukoplakia, transformation to squamous cell carcinoma is seen with a 5–15%. In this study, 74.9% of the dentists considered erythroplakia and leukoplakia as lesions which are most likely to be potentially malignant. These results were comparable to Ozge's findings [20]. On the other hand, in British Columbia and Nova Scotia, only 41.2% and in Maryland only 32% of dentists defined erythroplakia and leukoplakia as the most likely to be potentially malignant [29].

Our results are consistent with those of Özge et al. in Turkey, but much higher than those reported in British Columbia, Nova Scotia, and Maryland. This similarity may be explained by comparable epidemiological contexts, where tobacco use and related risk factors are highly prevalent, leading to a greater clinical exposure to leukoplakia and erythroplakia. In addition, dental curricula in both Tunisia and Turkey emphasize these lesions as classical potentially malignant disorders, thereby improving recognition among practitioners. In contrast, in North America, dentists may encounter fewer of these lesions in daily practice, and educational programs may focus more on overt cancer signs rather than early potentially malignant disorders, which could explain the lower recognition rates observed.

Demographic variations in knowledge

From the data analysis we concluded that there were some differences within the investigation group, dentists who correctly answered the questionnaire were those

aged less than 40 years, this can be explained by the changes in the dental school curriculum and their higher frequency in attending seminars and congresses to update their knowledge.

In terms of sex, female dentists showed higher rates of oral cancer knowledge compared to males. The feminization of dentistry has been noticed in previous studies in Monastir, Tunisia [30], and worldwide [31].

Oral surgeons and hospital university members had higher rates of knowledge compared to other specialists since they are the ones who are trained in oral cancer patients management. These results were similar to Colella's et al study in Italy [25].

The dentists who participated in our survey expressed an interest in expanding their awareness and knowledge regarding oral cancer. Comparable studies around the world, such as USA [32,33], United Kingdom [34], Jordan [35], and Iran [36] have also shown that doctors lacked knowledge necessary to identify oral cancer but they were motivated by an ambition to deepen their understanding since it is known that if they can successfully improve it, they will be able to detect oral cancer earlier [37].

Implications and recommendations

This study underscores the need to strengthen oral cancer education in undergraduate curricula and provide regular continuing education for practicing dentists. Integrating structured training on premalignant lesions, risk factor assessment, and early diagnostic techniques could improve early detection rates. Moreover, awareness campaigns on lifestyle-related risk factors and patient counseling for tobacco and alcohol cessation should be reinforced. International evidence shows that educational interventions can significantly improve dentists' knowledge, attitudes, and screening practices [35,36,37], which may ultimately reduce morbidity and mortality associated with oral cancer.

Study limitations

The strength of this study, is that this was the first study in Tunisia among dentists assessing their knowledge, attitudes and practices on oral cancer. However, it had several methodological limitations that must be considered. Firstly, the questionnaire was elaborated in English, however English is the third language in Tunisia; a higher response rate might be obtained by including versions in French and Arabic. Secondly, all data were self-reported and subjective. Therefore, the generalizability of our findings may be limited. Moreover, Dentists who haven't access to social media were not included in our study and for this reason, results could not be generalized to all of the dentists and thus it could not be a representative sample of dentists in Tunisia. Another limitation was the type of experimental design used. The present study was cross-sectional and might reflect the reality of the investigated sample, however, it would be worthwhile to study the causal associations using a longitudinal one.

Recommendations

In the present survey, a lack of doctors' knowledge regarding oral cancer in Tunisia can be seen. Therefore, we suggested the following recommendations for the improvement of oral care and future scientific studies:

To the attention of the ministers of health and social affairs:

- Encourage the granting of scholarships to doctors for specialization in dental medicine and oral surgery, to strengthen skills in this field.
- Favor the creation of health insurance accessible to all citizens to ensure adequate medical coverage.
- Organize awareness and screening caravans for cancers of the oral cavity screening.

To the attention of the general health directorate:

- Implement measures to significantly reduce the costs of post graduate courses.
- Sponsor and encourage the national scientific conferences in this field.
- Include oral cancer examination performance in the clinical portion of dental licensure.

To the attention of dentists, residents and hospital-university doctors:

- Ensure accurate investigations and complete medical files filling, as well as regular updating of records and consultation charts during appointments with patients.
- Develop a standardized clinical chart with all necessary data to facilitate communication between physicians and data collection for future studies.

To the attention of healthcare personnel:

- Raise awareness among healthcare personnel about the importance of computed tomography and anatomopathological examination in the diagnosis and management of oral tumors.
- Refer patients to specialists as early as possible.

To the attention of the Tunisian population:

- Maintain good oral hygiene.
- Promptly consult a healthcare professional in case of any swelling or lesion in the face or oral cavity.
- Adhere to follow-up appointments after medical or surgical treatment.
- Join health insurance schemes to ensure better medical coverage.

These recommendations aimed to improve oral medicine, strengthen oral health prevention, and facilitate access to diagnoses and treatments for the Tunisian population.

CONCLUSION

This cross-sectional study, carried out among dentists in Tunisia, sheds light on both the strengths and gaps in dentists' knowledge and practices concerning oral cancer prevention and early detection. Findings from this study can serve as a basis for forthcoming educational initiatives tailored for dentists, aiming to bolster awareness and knowledge regarding oral cancer prevention.

Additionally, these findings can inform enhancements to dental curricula, further strengthening knowledge and awareness surrounding oral cancer prevention strategies.

REFERENCES

1. Stewart BW, Wild CP. World cancer report 2014. International Agency for Research on Cancer, Lyon
2. Mahjour F, Dambal V, Shrestha N, Singh V, Noonan V, Kantarci A, et al. Mechanism for oral tumor cell lysyl oxidase like-2 in cancer development: synergy with PDGF-AB. *Oncogenesis* 2019; 8(5): 34
3. Howlader N, Noone A, Krapcho M, Miller D, Brest A, Yu M, et al. SEER cancer statistics review, 1975–2017. National Cancer Institute Bethesda, MD. 2020
4. Bota JP, Lyons AB, Carroll BT. Squamous cell carcinoma of the lip-a review of squamous cell carcinogenesis of the mucosal and cutaneous junction. *Dermatol Surg* 2017; 43(4): 494-506
5. Bagan J, Sarrion G, Jimenez Y. Oral cancer: clinical features. *Oral Oncol* 2010; 46(6): 414–7
6. Marino R, Haresaku S, McGrath R, Bailey D, McCullough M, Musolino R, et al. Oral cancer screening practices of oral health professionals in Australia. *BMC Oral Health* 2017;17(1):151
7. Coppola N, Mignogna MD, Riviello I, Blasi A, Bizzoca ME, Sorrentino R et al. Current knowledge, attitudes, and practice among health care providers in OSCC awareness: systematic review and meta-analysis. *Int J Environ Res Public Health* 2021; 18(9): 4506.
8. Mathur S, Conway DI, Worledge-Andrew H, Macpherson LMD, Ross AJ. Assessment and prevention of behavioural and social risk factors associated with oral cancer: protocol for a systematic review of clinical guidelines and systematic reviews to inform primary care dental professionals. *Syst Rev* 2015; 4(1): 184
9. López-Jornet P, Camacho-Alonso F, Molina-Miñano F. Knowledge and attitudes about oral cancer among dentists in Spain. *J Eval Clin Pract* 2010; 16: 129-33
10. Ph BK, Sundaram D, Ellepola ANB. Assessing oral cancer knowledge among undergraduate dental students in Kuwait University. *J Canc Educ* 2015; 30: 415-20
11. Yellowitz JA, Horowitz AM, Drury TF, Goodman HS. Survey of U.S. dentists' knowledge and opinions about oral pharyngeal cancer. *J Am Dent Assoc* 2000; 131(5): 653–61
12. Alonge O, Narendran S. Opinions about oral cancer prevention and early detection among dentists practising along the Texas-Mexico border. *Oral Dis* 2003; 9(1): 41–5.
13. Gaballah K, Faden A, Fakhri FJ, Alsaadi AY, Noshi NF, Kujan O. Diagnostic accuracy of oral cancer and suspicious malignant mucosal changes among future dentists. *Healthcare* 2021; 9(3): 263
14. Hertrampf K, Wenz HJ, Koller M, Grund S, Wiltfang J. Early detection of oral cancer: dentists' opinions and practices before and after educational interventions in Northern-Germany. *J Craniomaxillofac Surg* 2013; 41(8): e201–7
15. Gajendra S, Cruz GD, Kumar JV. Oral cancer prevention and early detection: knowledge, practices, and opinions of oral health care providers in New York state. *J Cancer Educ* 2006; 21:157-62
16. Kazmi F, Alkait S, Alghamdi H, Alhussain G, Tabassum A. Assessing knowledge, attitude and practices for oral squamous cell carcinoma among health care professionals in Princess Nourah University, Riyadh. *KSA Asian Pac J Cancer Prev* 2020; 21(2): 539-45
17. Stewart BW, Wild CP. World cancer report 2014. International Agency for Research on Cancer, Lyon
18. Ministère de la Santé – Direction des Etudes et de la Planification. Démographies Médicale, des médecins dentistes, pharmaciens et du personnel soignant. *Les Chiffres Clés*. 2018
19. Serhier Z, Bendahhou K, Ben Abdelaziz A, Bennani Othmani M, Réseau Maghrébin PRP2S. Fiche Méthodologique n°1: Comment calculer la taille d'un échantillon pour une étude observationnelle ? *La Tunisie Médicale* 2020; 98 (01)
20. Kebabcioğlu Ö, Namdar Pekiner F. Assessing Oral Cancer Awareness Among Dentists. *J Cancer Educ* 2018; 33(5): 1020-26

21. Golburean O, Hagen MH, Uncuta D, Tighineanu M, Manrikyan G, Vardanian I et al. Knowledge, opinions, and practices related to oral cancer prevention and oral mucosal examination among dentists in Moldova, Belarus and Armenia: a multi-country cross-sectional study. *BMC Oral Health* 2021; 21(1): 652
22. Nazar HS, Ariga J, Shyama M. Oral Cancer Knowledge, Attitudes, and Practices among Newly Graduated Dentists in Kuwait. *Asian Pac J Cancer Prev* 2022; 23(2): 459-65
23. Düzlü M, Karamert R, Bakkal FK, Cevizci R, Tutar H, Zorlu ME et al. The demographics and histopathological features of oral cavity cancers in Turkey. *Turk J Med Sci* 2016; 46(6): 1672-6
24. World Cancer Research Fund International. Mouth and oral cancer statistics. [En ligne]. 2022. [Consulté le 5 juin 2024]. Disponible à partir de : <https://www.wcrf.org/cancer-trends/mouth-and-oral-cancer-statistics/>
25. Colella G, Gaeta GM, Moscariello A, Angelillo IF. Oral cancer and dentists: knowledge, attitudes and practices in Italy. *Oral Oncol* 2008; 44: 393-9
26. Vijay Kumar KV, Suresan V. Knowledge, attitude and screening practices of general dentists concerning oral cancer in Bangalore City. *Indian J Cancer* 2012; 49: 33-8
27. Joseph BK, Devipriya BS, Prem S. Oral cancer awareness among dentists in Kuwait. *Med Princ Pract* 2012; 21:164-70
28. Alaizari NA, Al-Maweri SA. Oral cancer: knowledge, practices and opinions of dentists in Yemen. *Asian Pac J Cancer Prev* 2014; 15: 5627-31.
29. Clovis JB, Horowitz AM, Poel DH. Oral and pharyngeal cancer: knowledge and opinions of dentists in British Columbia and Nova Scotia. *J Can Dent Assoc* 2002; 68: 415-20
30. Khemiss M, Bagga S, Berrezouga L, Ben Khélifa M. Motivation and attitudes of Tunisian students for choosing the dental profession. *La Tunisie Médicale* 2019; 97(2): 321-6
31. Whelton H, Wardman MJJo DE. The landscape for women leaders in dental education, research, and practice. *J Dent Educ* 2015; 79(5 Suppl): S7-12.
32. Applebaum E, Ruhlen TN, Kronenberg FR, Hayes C, Peters ES. Oral Cancer Knowledge, Attitudes and Practices. *J Am Dental Ass* 2009; 140(4): 461-7
33. Reed SG, Cartmell KB, Duff y NG, Wahlquist AE, Sinha D, Hollinger A et al. Oral cancer preventive practices of South Carolina dentists and physicians. *J Cancer Educ* 2010; 25(2): 166-73
34. McCann PJ, Sweeney MP, Gibson J, Bagg J. Training in oral disease, diagnosis and treatment for medical students and doctors in the United Kingdom. *Br J Oral Maxillofac Surg* 2005; 43(1): 61-4
35. Hassona Y, Sawair F, Baqain Z, Maayta W, Shahin A, Scully C. Oral Cancer Early Detection - a Pressing Need for Continuing Education in Jordan. *Asian Pacific Journal of Cancer Prevention* 2015; 16(17):7727-30
36. Borhan-Mojabi K, Moradi A, Yazdabadi A. Evaluating the degree of knowledge on oral cancer among general practitioners and dentists in Qazvin. *J Eval Clin Pract* 2012; 18(2): 498-501
37. Silverman S, Kerr AR, Epstein JB. Oral and pharyngeal cancer control and early detection. *J Cancer Educ* 2010; 25(3): 279-81