

Knowledge and Attitudes of Medical Doctors and Dentists About Oral Cavity Carcinoma

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ABSTRACT

Background: The aim of this cross-sectional study was to assess the knowledge and attitudes of medical and dental doctors regarding oral cancer and to identify differences between the two groups.

Methods: In a cross-sectional study medical and dental doctors (n=157) completed the questionnaire containing data on demographics, attitudes and self-assessment of knowledge and clinical practice, knowledge of clinical presentation, etiology and treatment of oral carcinoma.

Main findings: Dental practitioners performed preventive examinations significantly more often than medical doctors (46.4% for dental practitioners; 9.1% for medical doctors) and reported higher self-assessed knowledge of oral cancer (75.4% for dental practitioners; 52.3% for medical doctors). Knowledge gaps were observed in both groups, particularly regarding precancerous lesions, risk factors, and early symptoms, with over 70% of respondents failing to identify precancerous conditions. Most medical doctors examined the oral cavity only when symptoms were reported, whereas 66.7% of dental practitioners performed oral examinations at every patient visit.

Principal conclusions: Most physicians expressed a willingness to pursue further professional training, creating an opportunity for the systematic implementation of educational programs on oral malignancies. The results confirm the importance of integrating preventive examinations and education into daily clinical practice, as well as incorporating topics on oral cancers into continuing medical education programs.

Key words: oral cancer, physician education, prevention, risk factors, early detection

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INTRODUCTION

Oral cancer is a malignant tumor that most commonly affects the tongue and the floor of the mouth, but it can occur in any anatomical subunit of the oral cavity. It is the most frequent malignant tumor in the head and neck region (1). The etiology of oral cancer involves a combination of endogenous and exogenous factors. The main endogenous factors include age, sex, genetic mutations, and heredity, while the most significant exogenous factors are recognized as tobacco and alcohol consumption. Cancer develops as a result of the interaction between genetic factors, exposure to carcinogenic substances, and immune response, and according to recent studies, the oral microbiome may also play an important role (2-4).

The clinical presentation of oral cancer depends on its localization due to the functional and anatomical differences of the oral cavity subunits. The stage at which the disease is diagnosed also affects its clinical manifestation. In the early stage, the tumor typically presents as a clearly defined, shallow mucosal ulcer that does not heal, often asymptomatic or accompanied only by mild discomfort, which leads to late recognition (1, 5). If left untreated, the lesion progresses into an ulcer with raised edges and may infiltrate surrounding tissues. The most common initial form is erythroplakia, whereas ulcerations and leukoplakias frequently occur in later stages. Due to early lymphatic dissemination, swelling of the cervical lymph nodes may be the first clinical sign (6). The most important prognostic factor is the stage of the disease at diagnosis. At stage I, the five-year survival rate is 80–90%, while with each subsequent stage, it decreases by approximately 20% (1, 7).

In the Federation of Bosnia and Herzegovina during 2021, oral and pharyngeal cancer ranked among the leading malignancies, with a prevalence of 4/10,000 in women and 6/10,000 in men—more common than cancers of lymphatic tissue, hematopoietic organs, and the

brain (8). In neighboring Croatia, 455 new cases were registered in 2022, with the majority being men over 60 years of age (9). According to the Cancer Registry, in 2021 there were 1,010 new cases (795 men, 215 women), with 538 deaths from the same cancer; in 2022, the number of deaths increased to 547 (10). Similar rising trends in incidence are observed throughout Europe, with a particularly marked increase among older men (11).

Early recognition of symptoms is crucial for treatment outcomes. Since the oral cavity is easily accessible to visual examination, education of healthcare professionals about regular preventive examinations plays a key role (12). General practitioners and dental practitioners can significantly contribute to reducing mortality through regular examinations and appropriate procedures when oral cancer is suspected. According to the World Health Organization and the American Cancer Society, regular oral cavity examinations among high-risk groups are among the most effective preventive measures (13).

Numerous studies in Europe and worldwide indicate a low level of physicians' knowledge regarding the early signs of oral cancer, particularly in recognizing precancerous changes and referring patients in a timely manner. Contributing factors include a lack of formal education, limited clinical experience, and lower levels of self-confidence (14, 15).

The aim of this study was to assess the level of knowledge of medical doctors and dental practitioners regarding the clinical presentation, etiology, and treatment of oral cancer, as well as their attitudes toward preventive examinations and the need for additional education. Furthermore, the study aimed to evaluate differences in knowledge and attitudes in relation to profession, work experience, and time since graduation, with particular emphasis on the importance of prevention and early detection of the disease.

This approach aligns with recent recommendations of the European Union and the scientific community, which emphasize the need to integrate education on oral malignancies into all levels of healthcare training (16, 17).

MATERIALS AND METHODS

A cross-sectional study was conducted from March to June 2025 in the Herzegovina-Neretva and West Herzegovina counties.

Participants

The participants were medical doctors and dental doctors from health centers in Ljubuški, Grude, Široki Brijeg, Posušje, and Mostar, the University Clinical Hospital Mostar, and private healthcare institutions in the aforementioned cantons. The study included general practitioners, family medicine or emergency medicine specialists, as well as general dental practitioners and specialists from all branches of dental medicine. The questionnaire was prepared in written form and was personally administered at healthcare facilities, while a part of the responses was collected online.

Methods

A structured questionnaire was used, divided into three parts: (1) demographic data, (2) attitudes and self-assessment of knowledge and clinical practice, (3) knowledge of clinical presentation, etiology, and treatment through 12 multiple-choice questions with one correct answer (Tables 1, 2, and 3).

Statistical analysis

Statistical analysis results were expressed with absolute and relative frequencies. The significance of the differences was tested with χ^2 test (Fischer's exact test was used in the absence of anticipated frequencies) and the Student *t* – test. The statistical analysis results were interpreted with the significance rate of $p < 0.05$. If the *p* value could not have been expressed up to three decimals, they were expressed as $p < 0.001$. IBM SPSS statistics 21 for

Windows (version 26.0, SPSS Inc, Chicago, Illinois, USA) was used for the statistical analysis of the given data.

RESULTS

A total of 157 respondents participated in the study, with an almost even distribution by profession: 88 medical doctors and 69 dental doctors. The majority were female (72.61%), and most respondents had not completed specialization training (70.06%). The most common specializations among medical doctors were family medicine, and among dental doctors, oral surgery and orthodontics. More than half of the participants had between 0 and 5 years of work experience (52.23%), and most were employed in health centers. The majority of participants were from Herzegovina-Neretva County, primarily from the city of Mostar.

The assessment of attitudes and self-evaluation of knowledge among doctors revealed statistically significant differences between the examined groups (Table 1). Dental doctors significantly more often than medical doctors stated that they had acquired sufficient knowledge during their studies to recognize oral cancer (49.3% DMD; 33.0% MD; $p = 0.023$) and that they had more clinical experience with patients with oral lesions during their studies ($p = 0.001$). Only 33.0% of medical doctors believed they had gained enough knowledge during their studies to recognize oral cancer (Table 1).

Over 60.2% of medical doctors and 85.5% of dental doctors reported knowing how to perform a detailed oral cavity examination ($p = 0.002$), while 52.3% of medical doctors and 75.4% of dental doctors claimed to know how to recognize oral cancer ($p = 0.003$) (Table 1). The difference between the groups was statistically significant in favor of dental doctors.

A highly statistically significant difference was observed in the implementation of preventive examinations (Table 1). Only 9.1% of medical doctors regularly examine the oral cavity,

compared to 46.4% of dental doctors ($p < 0.001$), while 87.5% of medical doctors reported not performing such examinations routinely. Most respondents believed that preventive examinations should be part of routine healthcare, although medical doctors more frequently emphasized the need to target high-risk groups ($p = 0.001$) (Table 1).

Habits related to oral mucosa examination also varied significantly (Table 1). A total of 90.9% of medical doctors examined the oral cavity only when patients reported symptoms, and only 8.0% did so at every visit, whereas 66.7% of dental practitioners performed examinations during every patient visit ($p < 0.001$). Physicians more often palpated lymph nodes (88.6% always), whereas dentists tended to perform this procedure selectively (65.2%) ($p < 0.001$) (Table 1).

Despite the differences in clinical practice, almost all respondents reported paying attention to all regions of the oral mucosa during examination (94.3% of medical doctors and 92.8% of dental doctors), with no significant difference between the groups ($p = 0.875$) (Table 1).

In the knowledge assessment (Table 2), dental practitioners achieved a higher number of correct answers in 10 out of 12 questions, although statistically significant differences were observed only in certain items. A significant difference was found in identifying the site with the worst prognosis (31.8% vs. 60.9%; $p = 0.001$), favoring dental doctors.

The highest number of correct answers in both groups was recorded for the question regarding the most affected age group (83.0% of medical doctors and 88.4% of dental doctors; $p = 0.465$), while the greatest number of incorrect answers was found in the question about precancerous conditions, with more than 60% incorrect answers in both groups (Table 2).

In several key domains, knowledge was limited. Only 31.8% of medical doctors and

36.2% of dental doctors correctly identified the most common site of oral cancer ($p = 0.681$), while early symptoms were correctly identified by 33.0% and 36.2%, respectively ($p = 0.795$). Similarly, only 31.8% of medical doctors and 37.7% of dental doctors correctly identified the main risk factors ($p = 0.550$) (Table 2). In most questions, the percentage of correct answers was below 50%, indicating significant knowledge gaps. Although doctors of dental medicine reported higher confidence in their self-assessed knowledge, in objective knowledge testing they achieved a statistically significantly better result in only one question compared to medical doctors (question 2). This suggests that additional education is needed in both groups, and that self-perceived competence does not necessarily reflect actual knowledge. Therefore, structured and continuous education programs should be implemented to improve early detection and management of oral cancer in both professions.

Regarding management (Table 3), all respondents stated that in case of suspected oral cancer, they would refer the patient to a specialist, though there was a marked difference in the choice of specialty ($p < 0.001$). Medical doctors most often chose an otorhinolaryngologist (25.0%), while dental doctors preferred an oral medicine specialist (33.3%). A maxillofacial surgeon was chosen with similar frequency by both groups (Table 3).

Most respondents believed that patient education about oral cancer should be regular and available to all patients (58.0% of medical doctors and 66.7% of dental doctors; $p = 0.413$) (Table 3). Furthermore, over 78% of respondents (78.4% of medical doctors and 78.3% of dental doctors; $p = 1.000$) believed that education for healthcare professionals should be mandatory and ongoing. Only a small minority (less than 2%) believed that additional education was unnecessary (Table 3).

Table 1. Self-assessment of knowledge and clinical experience, clinical practice, and attitudes toward preventive examinations among medical and dental doctors

	Professional title				χ^2	p
	MD		DMD			
	n	%	n	%		
1. During my studies, I believe that I have gained enough knowledge to recognize oral cavity carcinoma.					7.543	0.023
Yes	29	33.0	34	49.3		
No	50	56.8	24	34.8		
I'm not sure	9	10.2	11	15.9		
2. How many times during your studies did you have the opportunity to examine patients with precancerous and cancerous lesions of the oral mucosa?					17.556	0.001
Never	34	38.6	16	23.2		
Fewer than 2 times	39	44.3	20	29.0		
2-5 times	12	13.6	24	34.8		
More than 5 times	3	3.4	9	13.0		
3. I believe that I know how to perform a proper and thorough examination of the soft tissues of the oral cavity.					12.093	0.002
Yes	53	60.2	59	85.5		
No	25	28.4	8	11.6		
I'm not sure	10	11.4	2	2.9		
4. I believe that I know how to recognize oral cavity carcinoma.					11.359	0.003
Yes	46	52.3	52	75.4		
No	32	36.4	9	13.0		
I'm not sure	10	11.4	8	11.6		
5. Do you regularly perform a preventive examination of the oral cavity for the purpose of early detection of oral cavity carcinoma?					33.179	<0.001
Yes	8	9.1	32	46.4		
No	77	87.5	31	44.9		
I'm not sure	3	3.4	6	8.7		
6. Do you believe that mandatory preventive examinations of the soft tissues of the oral cavity should be implemented as part of routine medical evaluations?					11.483	0.001
Yes, preventive examinations should be an integral part of routine check-ups.	54	61.4	60	87.0		
Yes, but only for high-risk groups.	34	38.6	9	13.0		
7. When do you examine the oral mucosa?					63.049	<0.001*
Never	1	1.1	0	0.0		
During each patient visit	7	8.0	46	66.7		
When the patient reports subjective complaints	80	90.9	23	33.3		
8. Should the lymph nodes in the neck be palpated during an oral cavity examination?					61.289	<0.001*
Yes, always	78	88.6	20	29.0		
Yes, only when I consider it necessary	10	11.4	45	65.2		
No	0	0.0	4	5.8		
9. Do you consider it necessary to examine all regions of the oral mucosa during every check-up?					0.793	0.875*
Yes	83	94.3	64	92.8		
No	4	4.5	3	4.3		
I'm not sure	1	1.1	2	2.9		

*Fisher's exact test

Table 2. Knowledge of oral cancer among medical and dental doctors

Table 2: Knowledge of oral cancer among medical and dental doctors					χ^2	p
	Professional title					
	MD		DMD			
	n	%	n	%		
1. In your opinion, what is the most common location of oral cavity carcinoma?					0.168	0.681
Correct	28	31.8	25	36.2		
Incorrect	60	68.2	44	63.8		
2. In your opinion, which of the listed locations of oral cavity carcinoma has the worst prognosis?					12.062	0.001
Correct	28	31.8	42	60.9		
Incorrect	60	68.2	27	39.1		
3. In your opinion, what is the most common type of lesion observed in the clinical presentation of oral cavity carcinoma?					1.806	0.179
Correct	55	62.5	51	73.9		
Incorret	33	37.5	18	26.1		
4. In your opinion, what early symptoms of oral carcinoma include?					0.068	0.795
Correct	29	33.0	25	36.2		
Incorrect	59	67.0	44	63.8		
5. In your opinion, what are the subjective symptoms of oral carcinoma?					2.900	0.089
Correct	43	48.9	44	63.8		
Incorrect	45	51.1	25	36.2		
6. In your opinion, which of the following symptoms most commonly indicates the spread of oral cavity carcinoma to surrounding tissues?					1.704	0.192
Correct	27	30.7	29	42.0		
Incorrect	61	69.3	40	58.0		
7. In your opinion, what is the most common form of oral carcinoma?					0.063	0.802
Correct	45	51.1	33	47.8		
Incorecct	43	48.9	36	52.2		
8. In your opinion, which of the following conditions is primarily associated with the development of oral cavity carcinoma?					0.203	0.652
Correct	23	26.1	15	21.7		
Incorrect	65	73.9	54	78.3		
9. Select the two main risk factors that you consider key for the development of oral cavity carcinoma.					0.358	0.550
Correct	28	31.8	26	37.7		
Incorrect	60	68.2	43	62.3		
10. Which changes in the oral mucosa do you consider most commonly precede the development of oral cavity carcinoma?					0.402	0.526
Correct	29	33.0	27	39.1		
Incorrect	59	67.0	42	60.9		
11. Which age group do you consider most at risk for developing oral cavity carcinoma?					0.535	0.465
Correct	73	83.0	61	88.4		
Incorrect	15	17.0	8	11.6		
12. If you have a patient with a suspicious lesion in the oral cavity that does not heal, after how long would you refer them to a specialist?					0.993	0.319
Correct	52	59.1	47	68.1		
Incorrect	36	40.9	22	31.9		

*Fisher's exact test

Table 3. Management of suspicious lesions and attitudes toward additional education and patient awareness among medical and dental doctors

	Professional title				χ^2	p
	MD		DMD			
	n	%	n	%		
1. To which specialist would you refer patients suspected of having oral cavity carcinoma?					49.395	<0.001*
Otorhinolaryngologist (a)	22	25.0	1	1.4		
Maxillofacial surgeon (b)	5	5.7	6	8.7		
Specialist in oral medicine (c)	11	12.5	23	33.3		
Dermatovenereologist (d)	1	1.1	0	0.0		
a i b	5	5.7	3	4.3		
a,b i c	23	26.1	9	13.0		
a, b, c i d	4	4.5	1	1.4		
b i c	4	4.5	19	27.5		
a i c	12	13.6	4	5.8		
a, c i d	1	1.1	1	1.4		
b, c i d	0	0.0	2	2.9		
2. Do you discuss with your patients the avoidance of risk factors for oral cavity carcinoma and the implementation of preventive measures?					3.050	0.081
Yes	35	39.8	38	55.1		
No	53	60.2	31	44.9		
3. What is your opinion regarding patient education about oral cavity carcinoma?					2.090	0.413*
It should be essential and provided frequently	51	58.0	46	66.7		
It should be provided, but not too often	35	39.8	23	33.3		
It is not necessary because patients do not need to be informed about this topic	2	2.3	0	0.0		
4. What is your opinion on additional education for medical doctors and dentists regarding oral cavity carcinoma?					0.268	1*
Additional education is not necessary because I believe the knowledge acquired at university is sufficient	2	2.3	1	1.4		
Additional education is not essential, but it can be useful	17	19.3	14	20.3		
Additional education should be mandatory, especially for physicians who frequently examine the oral cavity	69	78.4	54	78.3		

*Fisher's exact test

DISCUSSION

This study originated from the observation of a discrepancy between the anatomical accessibility of the oral cavity for examination and the actual level of recognition of its pathological changes among physicians. The oral cavity is easily accessible for visual inspection, and both medical doctors and dental practitioners have the opportunity to examine it regularly in clinical practice. Despite this, new cases and deaths from oral cancer remain alarmingly high (6, 9). Since early diagnosis significantly increases survival rates (1, 6), the results of this study indicate the need

for systematic education of healthcare professionals.

Although dental practitioners more frequently reported knowing how to perform a detailed examination of the oral cavity and recognize cancer, the analysis of correct answers revealed that even within this group, there are significant gaps—particularly in recognizing precancerous lesions and the most common sites of the disease. A discrepancy was noted between perceived and actual knowledge, further emphasizing the importance of objective

assessment of knowledge and clinical competence.

A significant difference was observed in the frequency of preventive examinations—most dental practitioners examine all anatomical subunits of the oral cavity at every patient visit (66.7%), while general practitioners usually do so only when subjective symptoms are present (90.9%). Nevertheless, most respondents believed that preventive examinations should be an integral part of routine medical check-ups, though such practice is rarely implemented. This discrepancy between attitudes and actual behavior in clinical practice highlights the need to strengthen professional responsibility in everyday work.

Despite these differences, the majority of respondents in both groups recognized the importance of preventive examinations, with 61.4% of medical doctors and 87.0% of dental doctors supporting their implementation as part of routine healthcare. This discrepancy between attitudes and actual clinical behavior suggests the presence of systemic barriers, such as lack of time, insufficient training, or absence of clear clinical guidelines.

Similar findings were reported by Kovačević et al. (18) in a study conducted in Croatia, where only 12% of general practitioners and 68% of dentists regularly examined the oral mucosa, despite high awareness of the importance of early detection. The authors also found that the main barriers to performing preventive examinations included lack of time, insufficient education, and the absence of standardized guidelines for oral cavity examination in primary healthcare (18).

Differences were also noted in the palpation of lymph nodes - most medical doctors regularly perform palpation (88.6%), whereas dental doctors do so selectively (65.2%). Since the spread of disease to regional lymph nodes is crucial for determining disease stage, this practice directly affects the assessment of disease severity.

The largest number of incorrect answers was related to the recognition of precancerous conditions and the identification of key risk factors. This finding is particularly concerning, as treatment of precancerous lesions and conditions can prevent the development of invasive carcinoma or significantly improve the prognosis if cancer has already developed. Many respondents were unable to name even the two most important risk factors for the disease, although these are clearly defined in the literature (correct answers – 31% of medical doctors and 37% of dental doctors). This indicates a serious lack of knowledge that may negatively affect early detection and implementation of preventive measures. It is also important to note that while the vast majority of dental doctors and most medical doctors stated that they know how to perform an appropriate oral cavity examination and recognize oral cancer, only 31% of medical doctors and 36% of dental practitioners knew the most common site of occurrence. Alarming, only 33% of medical doctors and 36% of dental practitioners knew the early symptoms of oral cancer, even though early stages offer the highest chance of cure.

In a study conducted by De Angelis et al. (19) in Italy, a similar pattern was observed—only 29% of general practitioners could correctly identify precancerous lesions, and 72% stated that they did not feel competent enough to perform an oral cavity examination. The authors concluded that educational programs and practical workshops significantly increase confidence and diagnostic accuracy, especially among non-dental physicians (19).

A correlation was also observed between work experience and self-assessed knowledge—doctors with longer professional experience more often performed preventive examinations and showed higher rates of correct answers. Nevertheless, it is encouraging that most respondents expressed willingness to receive additional education on oral cancer, which provides a valuable foundation for developing targeted educational programs.

Similar results were found by Jovanović et al. (20) in a study conducted in Serbia among primary healthcare physicians and dentists. The authors reported that participants recognized the main risk factors for oral cancer, but that clinical confidence and frequency of mucosal examinations remained low. As in our study, most participants emphasized the need for further education and more systematic preventive programs. Such consistency of results points to similar educational challenges in the region and the need for a regional approach to early detection of oral cancer (20).

The limitations of this study include its geographically limited sample and the use of self-assessment, which may lead to discrepancies between perceived and actual knowledge and practice. Nevertheless, the results provide valuable insight into the current situation and can serve as a basis for developing targeted interventions in healthcare education.

Given that no similar study has been conducted in the Herzegovina region to date, the findings provide a valuable overview of physicians' knowledge and ability to recognize oral cancer early and manage it appropriately.

CONCLUSION

The results of this study indicate differences in knowledge and clinical practice between medical doctors and dental practitioners regarding oral cancer. Although dental professionals demonstrated greater confidence and better performance in certain areas, significant deficiencies were observed in both groups concerning the understanding of risk factors, early symptoms, and precancerous lesions.

Most respondents do not perform regular preventive examinations, despite being aware of their importance. This discrepancy between attitudes and practice highlights the need for better educational focus and greater emphasis on the practical application of knowledge in clinical work.

Encouragingly, physicians expressed a willingness to receive additional education, creating an opportunity for the development of continuous professional training focused on the early recognition of oral cancer. The integration of this content into the core curricula of medical and dental education, as well as into continuing medical education programs, is essential to improve early detection and reduce mortality associated with this disease.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTIONS

GT: Conceptualization, Investigation, Methodology, Data curation, Visualization, Writing – original draft, Project administration. SJ: Conceptualization, Methodology, Supervision, Validation, Writing – review & editing. IML: Project administration, Supervision, Writing – review & editing.

ETHICAL BACKGROUND

Institutional review board statement: This cross-sectional study was conducted according to all ethical principles at the School of Medicine, University of Mostar. This study was approved by the Committee for Graduate Theses of the Faculty of Medicine, University of Mostar and ethical approvals from the ethics committees of the health centers where study was conducted are available.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Data availability statement: We deny any restrictions on the availability of data, materials and associated protocols.

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