




Assessment of Dental Students and Dentists' Awareness and Management Toward Head and Neck Cancer Patients: A Cross-sectional Study in Makkah (Saudi Arabia)

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Abstract:

Purpose: The aim of this study was to assess head and neck cancer (HNC) knowledge and awareness among dental students and dentists in Makkah City, Saudi Arabia.

Methods: A cross-sectional online survey was carried out between October 2022 and February 2023. 310 undergraduate students at the faculty of dentistry, Umm Al-Qura University, as well as general dentists and consultants working either in the University Hospitals, public hospitals, or private clinics in Makkah were included in the study. The survey consisted of 26 questions divided into three sections: demographics, knowledge, practices and attitudes toward HNC early detection and management. Descriptive statistics were presented for the knowledge and attitude and Chi-square test was used to identify correlations, P value ≤ 0.05 was considered significant.

Results: Out of the 160 completed questionnaires, the majority of the participants were female (63.1%) and undergraduate students (77.5%). Regarding HNC general knowledge, acceptable levels were reported, however, the results showed a significant lack of knowledge concerning oral cancer complications and their association with cancer and cancer therapy. Additionally, there was no significant difference between males and females in the knowledge score ($p=0.82$) or attitude score regarding oncology patients ($p=0.5$). There was a significant difference in the overall knowledge between specialists and consultants ($p=.04$) compared to students, and general dentists. Knowledge was found to be directly proportional to individual's experience.

Conclusion: All participants had good general knowledge of HNC; however, they lacked sufficient knowledge about complications of cancer-associated therapy. HNC educational programs mostly in diagnosis, management, and prevention are required. Furthermore, there is a need to emphasize participation of graduated and practicing dentists of all levels of experience in future studies.

Keywords: Head and neck cancer, Oral cancer, Dental students, Knowledge, Awareness, Cancer therapy.

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1. INTRODUCTION

Head and neck cancer (HNC) describes any type of cancer growing in the oral cavity, nasal cavity, paranasal sinuses, larynx, pharynx, salivary glands, or lymph nodes of the head and neck, it is considered the 9th most common cancer globally [1]. Approximately 380,000 new cancer cases and 180,000 deaths were registered worldwide in the year 2020 [2]. Most of the recent HNC cases are found in developing countries [3]. Kujan *et al.* expected that by 2030, the number of new cases and deaths of oral cancer will double in the Middle East and North Africa, as a majority of countries in this region are from the developing world [4]. Oral cancer represents about 26% of HNC in Saudi Arabia, and unfortunately most cases are diagnosed at a late stage [5].

Most of oral cancers are found on the lateral border of the tongue, the floor of the mouth, and the lower lip. They are predominantly affecting elderly and middle-aged men with the highest incidence located between the sixth to eighth eras of life [4]. Many factors contribute to oral cancer in the middle east such as: the use of smokeless tobacco products (Shammah) [6, 7], Alqaat chewing [8], and evergreen shrub masticated for its amphetamine-like effects [9]. Additionally, viral infections by the human papillomavirus, industrial and environmental risk factors, and genetic instability contribute to oral cancer [10-14].

HNC can be treated by various methods, including supportive care measures (*e.g.*, antiresorptive therapies), chemotherapy (neoadjuvant, adjuvant, and/or concurrent), surgery and hematopoietic stem cell transplantation, and radiotherapy [15]. These methods have an effect on the teeth and the surrounding tissues, thus management of teeth and surrounding tissue is crucial for the HNC patient. For instance, 90% of patients undertaking radiotherapy may experience xerostomia; while about 60% may suffer from mucositis, 40% are affected by candidiasis, more than 50% can be affected by caries post-radiotherapy, and 15% of patients may suffer from osteoradionecrosis [16-20].

Cancer therapy has unavoidable chronic or acute oral side effects, proper management of these complications has the potential to reduce morbidity and improve prognosis if noticed early on [21]. Undeniably, there are substantial short- and long-term effects of cancer therapy on oral health. This requires increasing preventive measures, patient awareness, and managing the case by multidisciplinary healthcare providers including oncologists, otorhinolaryngologists, dentists, and other oral healthcare givers. The main role of the dentist treating patients with HNC is to care for the patient's oral cavity before, during, and after cancer therapy [22]. Although HNC has aggressive behavior and poor prognosis [23, 24], they are commonly associated with good prognosis if they are diagnosed early [25]. In the initial phases of the disease, the five-year survival rate varies from 30-70% with adequate treatment [26]. Unfortunately, a systematic review by Grafton-Clarke *et al.* [27] showed that oral cancers are frequently overlooked

by healthcare providers and the subsequent postponement in diagnosis and referrals is a main contributor to the disease's late stages. Dental practitioners perform a crucial role in the early detection and prevention of oral cancer due to their facial contact with patients [28].

Many papers showed that dentists' attitudes, knowledge, and practice towards HNC were inadequate. Guneri *et al.* [22] conducted a study at the University of Izmir (Turkey) to measure the knowledge of undergraduate students about HNC, the results showed that more than half of all participants were unaware that dental interventions should be done for HNC patients. In a cross-sectional investigation including general dentists and medical practitioners in Qazvin (Iran), dentists had adequate information which ranged from 38% - 68% of the 16 knowledge questions asked [29]. Another study of all dentists and dental specialists working in the South Khorasan Province (Iran) stated that dentists had correct responses between 51% and 83% of the 11 knowledge questions that they were asked [30]. Carter *et al.* compared the differences in awareness of oral cancer between the future doctors of medicine and dentistry in Great Britain, the 12-question survey explored participant's knowledge of risk factors, the possibility of advising patients, as well as signs and symptoms of oral cancer. The authors concluded that participants didn't have adequate knowledge [31]. Similarly, Clovis *et al.* [32] reported a negative correlation between knowledge and years of practice among a random sample of Canadian dentists in British Columbia and Nova Scotia. Kujan *et al.* [28] stated that about 87% of undergraduate dental students in Saudi Arabia felt confident about carrying out an intraoral examination to look for HNC lesions. However, awareness and knowledge of HNC are low among the general community of Saudi Arabia in the Makkah region [33, 34]. Two-thirds of Saudi people are unfamiliar with the early signs and symptoms of HNC, and just 12% have learned about oral cancer from their dentists [35, 36]. This lack of awareness is directly related to late recognition in 50% of HNC cases.

Therefore, this study was designed to assess HNC knowledge and awareness among dental students and dentists in Makkah (Saudi Arabia). The null hypothesis is that there is no difference in knowledge, practices, and attitudes toward HNC early detection and prevention between participants.

2. METHODS

2.1. Study Design

This cross-sectional study intended to determine a baseline level of awareness and management HNC among oral health practitioners in Makkah City, Saudi Arabia.

2.1.1. Ethical Consideration

The study was in full agreement with the World Medical Association Declaration of Helsinki guidelines. Ethical approval was obtained from the Biomedical Research Ethics Committee, Umm Al-Qura (Approval No.: HAP0-02-K-012-2022-11-1356). Informed consent from participants was taken prior to the study.

2.1.2. Participants

An online questionnaire survey was distributed among dental students, interns, and faculty members in the Faculty of Dentistry, Umm Al-Qura University, as well as public hospitals and private clinics in Makkah.

The sample size was calculated according to the formula used for the whole population:

$n = Z^2 \times p \times q / e^2$, where n= the required sample size, $q = 1 - p$, with a 95% level of confidence and sample error $\pm 5\%$; we considered $q = 0.5$ to obtain maximum sample size. The sample for this study invited 310 participants.

The questions in the survey were established and improved based on The National Cancer Institute (NCI) recommendations to dental professionals [37, 38]. The questionnaire contained all HNC questions to measure dentists' awareness and management which was helpful in achieving the study's goals. The research was completed between October 2022 and February 2023, it targeted undergraduate students, general dentists, specialists, and consultants working either in university hospitals, public hospitals, or private clinics in Makkah. The survey content validity was assessed by an expert in oral medicine, it was ranked based on simplicity, relevance, ambiguity, and clarity.

The reliability of the study was evaluated utilizing the test-retest method where ten participants from the Faculty of Dentistry, Umm Al-Qura University who were not involved in the study finished the questionnaire two

times within two weeks. The Consequences of the two times were assessed using Pearson's correlation coefficient (Pearson's r) as a reliability test. Pearson's r showed a significant stability coefficient suggesting good test-retest reliability. Internal consistency reflects the inter-correlation between items in the questionnaire and can be quantified using the coefficient alpha "Cronbach's alpha". A Cronbach $\alpha = 0.76$ was obtained. Considering the internal consistency between items in the questionnaire, it was measured using the coefficient alpha "Cronbach's alpha". A Cronbach $\alpha = 0.767$ was obtained suggesting adequate internal consistency [39, 40].

The electronic questionnaire was created using Google Forms and opened using mobiles, PCs, or tablets devices. All participants provided informed consent.

The questionnaire contained 26 close-ended questions, all the questions were made mandatory to answer to avoid any missing data incidence, and hence the participants could not submit the questionnaire unless all questions were answered. The survey was grouped into three sections: demographics, knowledge, practices and attitudes toward HNC early detection and prevention. The first section involved information about the demographics such as gender, age, specialty, working field and education level (Table 1). The second section comprised questions about participants' knowledge regarding oral signs and symptoms of HNC (9 questions) (Table 2). The third part contained 12 questions about dental practices and attitudes toward patients having HNC (Table 3).

Table 1. Participant's demographics.

Variable	Frequency	Percent	P-value for Knowledge Score	
Gender	Female	101	63.1	0.82
	Male	59	36.9	
Specialty	Students	124	77.5	0.04
	General dentist	8	5.0	
	Specialist/Consultant	28	17.5	
Working experience	Less than 5 years	126	78.8	0.03
	5-10 years	11	6.9	
	More than 10 years	23	14.4	

Table 2. Participants' knowledge of oral cancer and its management.

	Answer	Frequency	Percent
1. Patients undergoing therapies for cancer may present with exacerbation of oral or perioral herpes simplex virus or varicella zoster virus	Agree	102	63.7
	Disagree	7	4.4
	I'm not sure	51	31.9
2. Cancer treatment, especially radiation therapy for HNC may cause salivary gland hypo-function	Agree	150	93.8
	Disagree	1	.6
	I'm not sure	9	5.6
3. Osteoradionecrosis of the jaw (ORNJ) is NOT potentially severe risk of patient under radiotherapy	Agree	23	14.4
	Disagree	114	71.3
	I'm not sure	23	14.4

(Table 2) contd....

	Answer	Frequency	Percent
4. Patients undergoing therapies for cancer may present with opportunistic oral infections	Agree	137	85.6
	Disagree	1	.6
	I'm not sure	22	13.8
5. The most common oral complications related to cancer therapy include salivary gland dysfunction and taste disturbance	Agree	130	81.3
	Disagree	3	1.9
	I'm not sure	27	16.9
6. Oncology patients are at high risk of developing dental caries	Agree	122	76.3
	Disagree	3	1.9
	I'm not sure	35	21.9
7. The ideal time to do a comprehensive oral evaluation for HNC patient is after a cancer diagnosis and before radiotherapy	Agree	120	75.0
	Disagree	12	7.5
	I'm not sure	28	17.5
8. Dental caries is one of the major oral problems associated with radiotherapy and needs to be discussed with HNC patients before radiotherapy	Agree	126	78.8
	Disagree	14	8.8
	I'm not sure	20	12.5
9. The oral cavity is often subject to complications from radiotherapy because the soft tissue in the mouth becomes easily damaged and infected	Agree	129	80.6
	Disagree	3	1.9
	I'm not sure	28	17.5

Table 3. Participants' attitude regarding oncology patients undergoing dental treatment.

	Answer	Frequency	Percent
1. Consulting with the patient's oncologist/oncology team to determine whether the patient can receive invasive dental treatment	Agree	142	88.8
	Disagree	1	.6
	I'm not sure	17	10.6
2. In case of low salivary flow, Saline solution can be used for lubrication	Agree	73	45.6
	Disagree	25	15.6
	I'm not sure	62	38.8
3. Antibiotic prophylaxis protocols prior to invasive dental procedures in people undergoing cancer treatment may be required	Agree	88	55.0
	Disagree	10	6.3
	I'm not sure	62	38.8
4. For oral lesions that can be accessed by the patient, topical corticosteroid ointments can be used	Agree	87	54.4
	Disagree	10	6.3
	I'm not sure	63	39.4
5. Use of powered toothbrush is forbidden if there is possibility to trauma	Agree	75	46.9
	Disagree	17	10.6
	I'm not sure	68	42.5
6. If toothpaste is not tolerated, 0.9% saline or water may be used instead	Agree	38	23.8
	Disagree	24	15.0
	I'm not sure	98	61.3
7. In cases where routine brushing and interdental cleaning are not possible, antimicrobial rinses may be used	Agree	104	65.0
	Disagree	9	5.6
	I'm not sure	47	29.4
8. Removal of fixed orthodontic appliances before starting oncological treatment is recommended	Agree	59	36.9
	Disagree	26	16.3
	I'm not sure	75	46.9
9. Implants can osseointegrate into the irradiated maxilla/mandible	Agree	40	25.0
	Disagree	55	34.4
	I'm not sure	65	40.6
10. Removal of mobile prosthetic replacements during oncology therapy is recommended	Agree	72	45.0
	Disagree	18	11.3
	I'm not sure	70	43.8
11. Before radiotherapy for HNC patients, oral/dental as a preventive measure fluoride application is recommended	Agree	128	80.0
	Disagree	3	1.9
	I'm not sure	29	18.1

(Table 3) contd....

	Answer	Frequency	Percent
12. The ideal time to begin endodontic treatment on a non-vital tooth with symptoms at least 7 days before radiotherapy	Agree	69	43.1
	Disagree	12	7.5
	I'm not sure	79	49.4

2.1.3. Statistical Analysis

Answers were gathered using the Google Drive Excel document. Descriptive statistics (percentages, means and standard deviation) were calculated and a comparison of the results levels between groups defined by the participants' characteristics was based on the Chi-square test. A P value ≤ 0.05 was considered significant. All analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 21 (Armonk, New York: IBM Corporation, USA).

3. RESULTS

Out of the 310 questionnaires that were electronically distributed, 160 were completed, representing a response rate of 52.1%. Most respondents were females (63.1%) while the male percentage was (36.8%), with a mean age of 26.4 ± 7.3 years old. The majority of participants were dental students (77.5%). Most of the dentists who completed the survey had less than five years of work experience (86.3%). The demographic data of the participants are presented in Table 1. Participants were asked about their knowledge regarding oral cancer risk factors, management and complications as shown in Table 2. The majority of the participants had an acceptable knowledge level about orofacial cancers and its associated complications. However, there was a lack of knowledge regarding oral cancer complications and their association with cancer and cancer therapy such as exacerbation of oral or perioral herpes simplex virus or varicella-zoster virus among patients undergoing therapies for cancer, caries association and oral cancer therapy, and that intraoral soft tissues become easily damaged and infected (31.9%, 21.9%, 17.5%), respectively. Osteoradionecrosis of the jaw is one of the major side effects that had both low and lack of awareness (28.8%). More than half of the participants were not sure or gave wrong answers about endodontic treatment timing for an oncology patient.

Dentists were asked about their management approach for an oncology patient undergoing therapy in the head and neck region as shown in Table 3. The majority of the participants agreed to consult the oncologist before starting invasive treatments (88.8%) and to apply preventive measures such as fluoride application before radiation therapy (80%). However, for the rest of the management questions, there was an obvious lack of knowledge regarding the proper approach to dealing with such patients.

There was no significant difference between males and females in the knowledge score ($p=0.82$) or attitude score regarding oncology patients ($p=0.5$). There was a significant difference in the overall knowledge depending on their rank ($p=0.04$) where consultants had better knowledge compared to students and general dentists.

Dentists with working experience of more than 5 years had better knowledge than those with less experience ($p=0.03$) and those with (5-10 years) of experience had significantly better attitudes compared to the rest ($p=0.001$).

4. DISCUSSION

In dental practice, intraoral and extraoral examination is a crucial phase during the examination of a new patient [41]. Proper examination is the main aiding tool in the early detection of HNC through early detection, the mortality rate could be significantly minimized in the population, however, that cannot be possible without proper knowledge. This cross-sectional study was designed to evaluate awareness and management toward HNC among students and dentists working in different sectors in Makkah City, Saudi Arabia, and to explore issues that may affect HNC diagnosis or prevention. "Cancer Therapies and Dental Considerations" are available on the ADA website, which acts as a guide for dentists and patients, upon which we built this questionnaire [38].

The response rate observed in this study amounted to 51.2% aligning closely with the response rate conducted in a previous study conducted in Saudi Arabia which reported a rate of 54.2% [26]. However, it is noteworthy that this figure falls notably short compared to another study conducted at Jazan University in Saudi Arabia which achieved a response rate of 90% [42]. The majority of respondents were undergraduate students (77.5%) and dentists or consultants with less than 5 years of work experience (78.8%). It appears that students are more eager to answer questionnaires or more eager to examine their knowledge, while on the other hand, general dentists and consultants are either uninterested in finishing questionnaires or overloaded with dental practices and have no appeal to spend time on surveys. Authors anticipated the opposite *i.e.*; the undergraduate students could give fewer responses due to being overburdened with studying and learning, while professionals would be more willing to respond. Our research disclosed that the level of HNC awareness and management among the majority of the surveyed participants is considered acceptable. These results are similar to the results of earlier studies conducted in Saudi Arabia [28, 42], Kuwait [39], and India [43] which showed good to excellent general knowledge of HNC among interns and undergraduate students. It is in contrast to other studies in Saudi Arabia [26, 33], and the United Arab Emirates [44], where the studies showed poor knowledge and awareness among similar groups of participants.

Regarding the level of knowledge of orofacial cancers and their associated complications, this study showed an adequate level of knowledge among the participants. This

is in agreement with the results of a local study conducted in Jeddah [33]. However, it is in conflict with another cross-sectional study conducted at Jazan in Saudi Arabia [26]. In this study, there was some defective knowledge on when and how to treat the oral complications that appear after patients get cancer therapy. This may be due to the majority of respondents being undergraduate students with limited involvement in treating cancer patients and just attending theoretical lectures about cancer, which affects the responses. These conclusions are in agreement with previous studies that revealed dentists' sufficient fundamental knowledge about HNC, but the shortage of awareness about dental treatment of cancer therapy-related complications [22].

The survey answers showed that there was deficient knowledge regarding certain points of the relationship between viruses and cancer. The most involved viruses in oral cancerous changes are human papillomavirus, herpes group viruses, hepatitis C viruses, and adenoviruses [45, 46]. The herpes viruses that are related to HNC are the human herpes virus, Epstein-Barr virus, and cytomegalovirus [45]. It is anticipated that worldwide between 15%-20% of carcinomas attaching the oropharynx are coinfecting by the human papillomavirus and herpes. But the coinfection rates of squamous cell carcinomas affecting the base of the tongue and tonsils increased between 25% - 70% [47]. Secondly, there was an existing deficiency in awareness regarding osteoradionecrosis as a potential risk associated with oral cancer. Osteoradionecrosis is the consequence of ischemic necrosis of the bones combined with soft tissue necrosis without the occurrence of the tumor lesion [48, 49]. Osteoradionecrosis of the lower jaw is a chronic late complication of radiotherapy in HNC patients, and several studies have stated its incidence to range between 4 and 9.7% [50-52], however, Studer *et al.* and Ben-David *et al.* [53, 54] stated in different articles that osteoradionecrosis incidents decreased over the past few decades due to the availability of more conformal techniques of intensity-modulated radiotherapy (IMRT). Dealing with active oral diseases and motivating oral health before and after cancer therapy may reduce the risk of osteoradionecrosis. The goal is to reduce the demand for invasive interventions such as extraction [55]. The lack of awareness in our sample might be related to low retention of the information about the topic itself or due to the way the question was directed in the survey in a way in which the correct answers were supposed to be (disagree) and the participants were tempted to pick (agree) as the correct answer.

There was a great variation in the answers about the relation between caries and radiotherapy as well as endodontic treatment before radiotherapy. Patients with HNC who will be exposed to radiotherapy should preferably obtain endodontic treatment before radiotherapy to remove any disease present on the mucosa or teeth as following radiotherapy, infection foci progress may become more aggressive [56]. After radiotherapy, patients are at high risk of dental caries due to

hyposalivation, and intra-oral microbial and chemical changes that occur which will result in cariogenic environments [57]. More than 50% of patients might develop caries over time with a prevalence of 6% monthly [58]. This is known as "radiation caries" which appear after head and neck radiotherapy [59]. Radiation caries happens even in non-exposed teeth to radiation, and if left untreated can continue leading to losing all teeth after three years [60].

This study found that the educational level and tenure greatly affect the overall HNC knowledge since the specialists and consultants had substantially better knowledge compared to the undergraduate dental students. This finding is in agreement with the Shubayr *et al.* study [26], but it is in contrast to the results of Keser *et al.* [61] that proved no relation between educational level and knowledge of risk factors of oral cancer. This may be attributed to the fact that the "Saudi Commission for Health Specialties" and the licensing association for healthcare practices in Saudi Arabia mandate that all dental graduates should attend various continuous education courses so they can apply to the "Saudi dental specialty post-graduate program" and to renew their present registration.

This is a cross-sectional study that permits researchers to take a snapshot of the target population regarding the knowledge and awareness of HNC. Cross-sectional studies offer a quick approach to collecting valuable data in specific areas. Additionally, this study is especially useful for advising the organization of educational HNC courses and practicing for undergraduate students, specialists, and consultants. The majority of respondents were female [62]. Moreover, the results might not be generalizable because of the participants' size and the distribution of the respondents.

There is a need to emphasize and expand HNC educational programs mostly in diagnosis, management, and prevention. The workshops and education programs are greatly advised to improve dentists' awareness of the diagnosis and risk factors of HNC.

Educating graduate dentists about orofacial head and neck cancer involves several key approaches:

(1) Didactic Education: Provide comprehensive lectures, seminars, or workshops covering the epidemiology, etiology, risk factors, signs and symptoms, diagnostic techniques, and management of orofacial head and neck cancer.

(2) Clinical Training: Offer hands-on clinical experiences where graduate dentists can observe, diagnose, and manage cases of orofacial head and neck cancer under supervision.

(3) Interdisciplinary Collaboration: Emphasize the importance of interdisciplinary collaboration with oncologists, radiologists, pathologists, and other healthcare professionals involved in the care of patients with orofacial head and neck cancer.

(4) Continuing Education: Encourage ongoing learning

through continuing education courses, conferences, webinars, and journal subscriptions to stay updated on the latest advancements in the field.

(5) Case Studies and Problem-Based Learning: Utilize case studies and problem-based learning approaches to enhance critical thinking and decision-making skills in diagnosing and managing orofacial head and neck cancer cases.

(6) Patient Communication Skills: Train dentists in effectively communicating with patients about the risk factors, the importance of early detection, treatment options, and supportive care measures for orofacial head and neck cancer.

(7) Screening Programs: Implement screening programs in dental clinics to facilitate early detection of orofacial head and neck cancer among patients.

By employing these strategies, graduate dentists can be better equipped to recognize, diagnose, and manage orofacial head and neck cancer, ultimately improving patient outcomes and survival rates.

CONCLUSION

Participants in this study proved to have good general knowledge of HNC, but they lacked knowledge about oral complications of cancer-associated therapy which must be emphasized through educational programs.

ABBREVIATIONS

HNC	=	Head and neck cancer
NCI	=	National Cancer Institute

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Biomedical Research Ethics Committee, Umm Al-Qura, Makkah, Saudi Arabia (Approval No.: HAPO-02-K-012-2022-11-1356).

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. This study was conducted in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2013 (<http://ethics.iit.edu/ecodes/node/3931>).

CONSENT FOR PUBLICATION

Participation consent was implied by completing the survey.

STANDARDS OF REPORTING

STROBE guidelines and methodologies were followed in this study.

AVAILABILITY OF DATA AND MATERIALS

All data is provided in this study and raw data can be requested from the corresponding author [M.F].

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest to declare.

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