



ORIGINAL ARTICLE

Oral and maxillofacial cancer: A 35-year retrospective analysis at a referral dental hospital in Saudi Arabia

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KEYWORD

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Abstract *Objectives:* As rates of oral and maxillofacial cancer (OMFC) continue to rise, the role of dentists in early detection and prevention has become increasingly important. The present study examined the frequency and pattern of OMFC cases diagnosed at a referral dental hospital.

Methods: A retrospective analysis of all primary malignant neoplasms of the oral and maxillofacial area diagnosed at the Histopathology Laboratory of the Dental University Hospital, Medical City, King Saud University, Saudi Arabia from 1984 to 2020 was performed.

Results: A total of 242 patients had histologically diagnosed primary malignant neoplasms of the oral and maxillofacial area, accounting approximately 3.7% of the archives. The mean age of patients was 48.87 years, and the male-to-female ratio was 1.5:1. The most prevalent malignant neoplasm was squamous cell carcinoma (SCC) (58.3%), followed by mucoepidermoid carcinoma (11.6%). The tongue and gingiva were the most prevalent malignancy sites, accounting for 19.8% and 18.2% of the cases, respectively. The prevalence of SCC in patients over 50 years old (68.4%) was highly significantly greater than that in younger subjects (31.5%) ($P < 0.0005$). SCC was also more common in males (66.7%) than in females (33.3%) ($P = 0.026$).

Conclusion: OMFC primarily affecting the tongue and gingiva was the predominant in older male patients. SCC was the most frequent type of OMFC and was significantly associated with age older than 50 years. This study provides baseline data on the frequency of OMFC cases diagnosed for the first time by dental practitioners and warrants the need for increasing OMFC awareness among these clinicians.

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1. Introduction

Cancer affecting the oral and maxillofacial area is a major health problem globally, and its incidence is increasing. Dentists should be conscientious about the impactful role they play in

diagnosing this condition. This specific anatomical region includes the mouth, lip, tongue, oropharynx, salivary glands and jaw bones. Oral cancer (OC), the most common cancer of this complex, represents the 16th most common malignancy and the 15th most frequent cause of cancer-related death worldwide (Ferlay et al., 2019). However, there is wide variation in the geographical incidence of this cancer, which is attributed to several factors, such as the level of health services, cultural habits, and economic status (Stewart and Wild, 2014; Warnakulasuriya, 2009a). Smoking and alcohol are the main risk factors related to OC. Other habits, such as smokeless tobacco use and areca nut chewing, have been reported in Asian populations (Cancer, 2012). The highest rates of OC have been described in Sri Lanka, Pakistan, India, Bangladesh, France and Hungary (Ferlay et al., 2010). Although OC is more common in males and older patients, increasing trends of OC in young and middle-aged males have been described in Brazil, India, the United States and some European countries (Llewellyn et al., 2001).

OC incidence recently increased in Saudi Arabia. The latest published cancer report from the Saudi Health Council, Saudi Cancer Registry in 2014 recorded a total of 138 OC cases, which represented approximately 1.2% of total cancer cases (Al-Shahrani et al., 2017). However, King Faisal Specialist Hospital & Research Center Tumor Registry in Riyadh indicated that OC accounted for 4% of all cancer types. In their report, OC was the 5th most common cancer in males and 11th most common cancer in females (King Faisal Cancer Centre Research, 2017). The oral cancer incidence is higher in Saudi Arabia than in other Gulf Cooperation Council (GCC) countries, such as Kuwait and the United Arab Emirates, which share similar geographic and cultural factors (Al-Madouj et al., 2011).

Oral cancer has one of the lowest survival rates worldwide (McGurk et al., 2005; Warnakulasuriya, 2009b). Unfortunately, a large number of OC cases are discovered in advanced stages (Neville and Day, 2002; Warnakulasuriya, 2009a), despite the ease of access to the oral cavity for the detection of a malignant lesion. A recent meta-analysis concluded that diagnosis delay was a probable risk factor for advanced-stage OC and mortality (Seoane et al., 2016). This finding highlights the difficulty for dentists to guarantee that all patients have a comprehensive oral cancer examination. Several studies indicated an alarming lack of knowledge of OC and concerning attitudes towards OC among dental professionals, who feel insufficiently trained to screen and diagnose this disease (Patton et al., 2005; Seoane et al., 2006; Warnakulasuriya and Johnson, 1999). The number of studies on OC in Saudi Arabia increased in the last decade (Patil et al., 2020). However, there is a gap in the epidemiological data on the incidence and pattern of oral and maxillofacial cancer (OMFC) cases diagnosed and encountered in dental practice. Determining the incidence of this group of lesions encountered by dental practitioners is the first step towards improving early diagnosis and prevention. Therefore, the present study examined the frequency and pattern of malignant neoplasms diagnosed at a referral dental hospital over a period of 35 years.

2. Methods

All cases in this study were collected from the archives of the Histopathology Laboratory of the Dental Hospital, Medical

City, King Saud University, Saudi Arabia. Pathology specimens in this laboratory are received from general and specialist dentists at the same dental hospital clinics and private and public dental practices in Riyadh. The electronic records of our laboratory were retrospectively searched for all OMFC cases that were documented from August 1984 to December 2020. The inclusion criteria for this study were any patient with a histologically confirmed primary malignant neoplasm of the oral and maxillofacial area. Neoplasms diagnosed with recurrence or metastasis were excluded. Repeated biopsies were grouped as a single case. For each case, patient age, sex, anatomical location, and histopathological diagnosis were obtained. Lesions were categorized according to site as lip, gingiva, buccal mucosa, tongue, floor of the mouth, vestibule of mouth, retromolar trigon, palate, maxillary sinus, upper jawbone, lower jawbone, parotid gland, other major salivary glands, overlapping lesions of the mouth, and mouth unspecified. Overlapping lesion of mouth were defined as a neoplasm that overlapped two or more contiguous sites, for which the point of origin could not be determined. Unspecified lesions of the mouth were defined as lesions that occurred in the mouth, and information about the exact site was not available. Cancer in the upper and lower jawbones were defined as lesions that occurred as intraosseous malignant neoplasms in the maxilla and mandible, respectively. All the data obtained from the study were tabulated and analyzed using frequency distributions by SPSS (Chicago, IL, USA). The statistically significant difference among groups was determined by the Chi-square test, and the level of significance was set at $P < 0.05$.

The study protocol was reviewed and approved by the Institutional Review Board of King Saud University - College of Medicine, Saudi Arabia (Research project no. E- 18-3573). The study was conducted in compliance with the ethical principles for medical research involving human subjects of the Helsinki Declaration.

3. Results

In this 35-year period (1984–2020), 6571 biopsies have been submitted by dental practitioners at the histopathology laboratory. A total of 242 patients had histologically diagnosed primary malignant neoplasms of the oral and maxillofacial area

Table 1 Distributions of basic information of patients.

Variable	Category	n	%
Gender n = 242	Male	147	60.7
	Female	95	39.3
Age groups n = 228*	1–10	5	2.1
	11–20	17	7.0
	21–30	20	8.3
	31–40	28	11.6
	41–50	45	18.6
	51–60	62	25.6
	61–70	27	11.2
	71–80	17	7.0
	81–100	7	2.9

* 14 missing data.

which represent around 3.7% of the archives. Basic information of patients is described in Table 1. Of these cases, 147 (60.7%) were men and 95(39.3%) were women, with a male:female ratio of 1.5:1. The mean age of patients was 48.87 years (S.D. = 19.08), (range, 2–91 years). Most (44.2%) of the patients were in the fifth or sixth decade of life at the time of diagnosis. Five patients were less than 10 years of age comprising; three lymphomas, rhabdomyosarcoma, and myoepithelial carcinoma. Investigation of the records revealed that the most prevalent malignant neoplasm was squamous cell carcinoma (SCC) (58.3%), followed by mucoepidermoid carcinoma of the salivary glands (11.6%). The mean age of the SCC patients was 57.41 years (S.D. = 13.59). Tongue and gingiva were the most prevalent malignancy site constituting 19.8% and 18.2% of the cases correspondingly, while the least common site was the maxillary sinus with 2 cases only (0.8%). Overlapping lesions that exceeded one anatomical area to invade the adjacent one was observed in 14 % of the patients and about half of them (15 cases) are SCC. Table 2 presents the clinical and

histopathological information of patients. The prevalence of SCC among patients more than 50 years old (68.4%) was highly significantly greater than that observed in younger subjects (31.5%) ($P < 0.0005$). Additionally, there was a statistically significant difference between the prevalence of OMFC with regards to gender, SCC was found to be more common in males (66.7%) than in females (33.3%) ($P = 0.026$) [Table 3].

4. Discussion

Oral and maxillofacial cancer comprises a heterogeneous group of diseases that affect a specific anatomical region; these diseases have various etiologies, clinical presentations, and prognoses. The present study used histopathological laboratory archives to determine the OMFC distribution. Data obtained from records are not precise enough to identify the prevalence and incidence of the disease. However, the data are helpful in predicting the regional distribution of the disease and the burden of this malignancy in the population. Determining the pattern and frequency of this group of malignancies encountered by dental practitioners is the first step towards improving early diagnosis and prevention.

Pathology specimens in our laboratory are received from general and specialist dentists at the same dental hospital clinics. Other private and public dental practices in the same city also send specimens for diagnosis. The services are free of charge and easily accessible to all practicing dentists. Therefore, the present study is unique because it investigated data from a specialized oral pathology laboratory rather than a general laboratory and ensure that all specimens were sent by dentists. These factors may provide insight into the number and types of OMFC cases that dentists discover in their clinics. Dentists are among the most frequently visited health care professionals (Center for disease control and prevention, 2018). Therefore, they are uniquely positioned to play a beneficial role in OMFC prevention. The current study showed that 3.7% of the submitted biopsies were malignant neoplasms that were diagnosed for the first time in the dental clinic. This finding highlights the need for increased awareness of the disease and training of dental practitioners to facilitate the early diagnosis of OMFC.

Cancer of the oral and maxillofacial region is considered a disease of old age however the age onset varies according to the type of malignancies. The mean age of patients included in this study was 48.87 years. Similarly, a study in Libya found that the mean age of patients diagnosed with malignant tumors of the orofacial region was 46 years (Subhashraj et al., 2009). When SCC cases were analyzed separately, the mean age of patients was 57.41 years which is comparable to those in other studies conducted in the region (Al-Jaber et al., 2016). The occurrence of SCC in patients older than 50 years was highly significantly greater than younger subjects. These findings are consistent with other studies worldwide (Warnakulasuriya, 2009a). A recent study in Saudi Arabia included 58 patients with head and neck tumors and found a significant difference in the mean age of patients, with older persons being more likely diagnosed with malignant tumors (Alsharif et al., 2021). The male-to-female ratio for OMFC in the present study was 1.5:1, which is consistent with the overall ratios reported in other studies in Arab countries (Al-Jaber et al., 2016). However, studies from the southern region of Saudi

Table 2 Distribution of clinical and histopathological information of patients (n = 242).

Variable	n	%	
Location	Lip	4	1.7
	Gingiva	44	18.2
	Buccal mucosa	28	11.6
	Tongue	48	19.8
	Floor of the mouth	6	2.5
	Vestibule of mouth	7	2.9
	Retromolar trigon	5	2.1
	Palate	26	10.7
	Maxillary sinus	2	0.8
	Upper jaw bone	10	4.1
	Lower jaw bone	8	3.3
	Overlapping lesion of mouth	34	14.0
	Parotid	9	3.7
	Other major salivary glands	7	2.9
	Mouth unspecified	4	1.7
Histopathology	Malignant neoplasms of epithelial origin		
	Squamous cell carcinoma	141	58.3
	Verrucous carcinoma	5	2.1
	Other carcinomas	6	2.5
	Malignant neoplasms of glandular origin		
	Mucoepidermoid carcinoma	28	11.6
	Adenoid cystic carcinoma	8	3.3
	Adenocarcinoma	4	1.7
	Polymorphous adenocarcinoma	3	1.2
	Others or unspecified salivary gland malignant tumors	6	2.5
	Malignant neoplasms of mesenchymal origin		
	Osteosarcoma	6	2.5
	Fibrosarcoma	2	0.8
	Rhabdomyosarcoma	4	1.7
	Other sarcomas or unspecified type	9	3.7
	Malignant neoplasms of lymphocytes and other origins		
	Lymphoma	16	6.6
Others	4	1.7	

Table 3 Association of age groups and gender with SCC and other OMFC cases separately.

	n (%)		Total (n)	χ^2	P
	SCC	Others			
<i>Age groups (years)</i>					
Less than 50	41 (31.5)	74 (77.9)	115	47.092140	< 0.0005
50 or more	89 (68.4)	21 (22.1)	110		
Total	130	95	225		
<i>Gender</i>					
Male	94 (66.7)	53 (52.4)	147	4.970116	0.026
Female	47 (33.3)	48 (47.5)	95		
Total	141	101	242		

SCC: squamous cell carcinoma, OMFC: oral and maxillofacial cancer.

Arabia found a higher occurrence of this cancer in females than in males (Allard et al., 1999; Brown et al., 2006; Idris et al., 2016). The increase in female OC occurrence in southern areas of Saudi Arabia may be attributed to the use of smokeless tobacco (Shamma) because it is a socially acceptable oral habit for women in this region. The current study showed that the most predominant histological type of all oral biopsies was SCC, which represented 58.3% of all OMFC cases. Similar proportions were found in Egypt (62.8%) (Ibrahim et al., 2009), the United Arab Emirates (62.3%) (Anis and Gaballah, 2013), and Syria (60%) (Shahrour et al., 2005). SCC comprised a much higher percentage of oral cancers in Jordan (84%) (Rawashdeh and Matalka, 2004), Iraq (91%) (Museedi and Younis, 2014), and Libya (100%) (Jaber and Abu Fanas, 2010).

The distribution of anatomical sites affected by OMFC varies between countries. These variations may be due to different prevalence of risk factors, such as oral habits and chronic exposure to solar radiation. High rates of lip malignancies have been reported in Europe, Canada and Australia. Conversely, malignant lip tumors have a very low incidence in Asia (Warnakulasuriya, 2009a). The current study reported a somewhat low percentage (1.7%) of lip cancer. The tongue is the most common location for OC in US and European populations and represents 40–50% of OCs (Warnakulasuriya, 2009a). The tongue was the most commonly affected site in most studies in Arab countries (Al-Jaber et al., 2016). The gingiva was the most frequently involved location in patients from the southern region of Saudi Arabia (Al-Rajhi et al., 2002). The present study showed that the most commonly affected site was the tongue followed by the gingiva. Cancer of the buccal mucosa is relatively common in Asian populations, especially in Sri Lanka (Warnakulasuriya, 2009a). A study from the southern region of Saudi Arabia revealed that the most common anatomical location was the buccal mucosa, which accounted for 52% (Idris et al., 2016). The current study showed that 11.6% of cancer cases occurred in the buccal mucosa. A study in Sudan reported that the most common OC presentation was a lesion that spread from one anatomical site to invade another contiguous site, and this pattern was found in 38% of cases (Osman et al., 2010). Similar observations, but with a lower percentage (14%), were found in present study. The association of all of the aforementioned anatomical sites and OMFC was analyzed and correlated with smokeless tobacco chewing habits (Allard et al., 1999; Johnson

et al., 1996; Saleh et al., 2017; Zain, 2001). The current study could not assess some risk factors, such as tobacco and alcohol use, due to insufficient available information. Other factors, such as patient occupation, oral hygiene practices, and ethnic group, were also not analyzed. An additional limitation of the study was the unavailability of the specialty of the referring dentist and years of experience.

There is a general consensus that survival is related to the stage of OC at the time of diagnosis, and early discovery improves the survival of patients who develop this malignancy (Peacock et al., 2008; Scott et al., 2008). Dental clinics represent an ideal setting to discover OC early because it is frequently visited by the general population and requires only a 90-second clinical examination to achieve early detection (Horowitz, 2001). Unfortunately, studies revealed that dentists are in crucial need of educational updates in the early detection and prevention of OC (Horowitz et al., 2000).

In conclusion, the current study showed a predominance of OMFC in relatively older male patients that primarily affected the tongue and gingiva. SCC was the most common type of OMFC, and it was significantly associated with age older than 50 years. This study provides baseline data on the frequency of OMFC cases diagnosed for the first time by dental practitioners. However, it was not possible to assess the prevalence of undiagnosed patients with malignancies who visited dental clinics. This study sheds light on the importance of the awareness of OMFC among dental practitioners and the need to improve their diagnostic abilities.

5. Authorship Declaration

I declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. This is a non-funded research and the research protocol was reviewed and approved by the Institutional Review Board of King Saud University - College of Medicine, Saudi Arabia. (Research project no. E- 18-3573). The author confirm that there has been no significant financial support for this work that could have influenced its outcome.

6. Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

7. Ethical statement

This study was conducted in accordance with the declaration of Helsinki and study the protocol of the study was approved by the Institutional Review Board of King Saud University - College of Medicine, Saudi Arabia (Research project no. E-18-3573).

CRediT authorship contribution statement

Ohoud Nasser Alotaibi: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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