

Epidemiology of Oral Cancer Diagnosed at a Singapore Tertiary Healthcare Institution

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Abstract

Introduction: Oral and pharyngeal cancers grouped together are the sixth most common cancer seen worldwide. Oral cancers are, however, relatively not common in Singapore. There are few published epidemiological studies of oral cancers seen in Singapore. This article is a retrospective study of oral cancer incidence in a major tertiary institution in Singapore from 1991 to 2001. **Materials and Methods:** All oral cancers diagnosed from 1991 to 2001 were extracted from the register of histopathology results and case notes were reviewed. **Results:** In our study, it was found that oral malignancies preferentially affect older males. Chinese, being the predominant ethnicity, reports the highest incidence of oral malignancy. Squamous cell carcinoma was the most common oral malignancy with the tongue being the most commonly affected site. The majority of patients who sought treatment had complaints of swelling and were referred from restructured government hospitals and clinics. **Conclusion:** Dental professional should be aware of the common clinical presentation of oral cancers. As oral cancer is a disease of high morbidity and mortality, a concerted effort from the government and healthcare profession will be required to improve the outcome of the disease.

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Introduction

Oral and pharyngeal cancers grouped together are the sixth most common cancer seen worldwide.¹ The annual estimated incidence is around 275,000 and 130,300 new cases of oral and pharyngeal cancers respectively.²

The most common type of head and neck cancer is squamous cell carcinoma.³ The most common site of malignancy in the oral cavity is the tongue in European and American populations and buccal mucosa in Asian populations.¹

The morbidity and mortality arising from the treatment of oral cancers are well documented. Current methods of treatment include surgery with neo-adjuvant radiotherapy with or without chemotherapy or in combination have resulted in good loco-regional control of the disease; the survival rate, however, has not improved much over the past decades especially in cases of regional metastasis. The overall survival rate in all stages of oral squamous cell

carcinoma was cited to be between 45% and 72%, and the survival rate is halved if cervical lymph node metastases are present.⁴

Oral cancers are, however, relatively not common in Singapore. There have been little data and few published epidemiological studies of oral cancers seen in Singapore. This paper aims to review previous oral cancers referred and diagnosed at the National Dental Centre over an 11-year period (1991 to 2001), to extract epidemiological data with respect to race, age at diagnosis, gender, types and sites of malignancies and also sources of referrals.

Materials and Methods

All cases of oral cancers diagnosed at our centre over an 11-year period between 1991 and 2001, were extracted from a register of histopathology results. Permission was granted from the local institutional review board to review

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the patients' case notes. The relevant data as detailed in Table 1 were retrieved.

Table 1. Histological Types of Oral Cancers Seen

Type of Cancer	Number of Cases Reported	Percentage
Cancer of epithelial origin		
Squamous cell carcinoma	134	77.5%
Spindle cell	4	2.3%
Salivary gland tumours		
Mucoepidermoid	9	5.2%
Adenocystic carcinoma	3	1.7%
Adenocarcinoma	4	2.3%
Unknown	1	0.6%
Other malignancies		
Clear cell	2	1.1%
Sarcoma	2	1.1%
Lymphoma	5	2.9%
Melanoma	2	1.1%
Osteosarcoma	2	1.1%
Origin of metastatic cancers		
Breast	1	0.6%
Liver	1	0.6%
Nasopharynx	1	0.6%
Gastrointestinal	1	0.6%
Unknown primary	1	0.6%
Total	173	100%

Inclusion Criteria

All oral cavity cancers were diagnosed based on anatomic sites as listed within the American Joint Committee on Cancer (AJCC) fifth edition of the Manual for Staging of Cancer.⁵ These sites include the tongue (ICD-02 topography codes C02.0-C02.9), gum (C03.0-03.9), floor of the mouth (C04.0-04.9), hard palate (C05.0, 05.8-05.9), cheek mucosa (C06.0), vestibule of the mouth (C06.1), retromolar area (C06.2), overlapping lesion of the mouth (C06.8) and lesion of the mouth not otherwise specified (NOS) (C06.9).

Exclusion Criteria

All cancers originating from the external lip and those involving the soft palate, uvula, tonsils, base of tongue are excluded from this study. These cancers are defined as not being within the oral cavity and also exhibit different local characterisation.

Histologic Type and Grade of Cancer

The histologic type and tumour grade of the identified oral cancer cases were grouped as follows:

1. Histologic type was grouped into 5 categories:
 - squamous cell carcinoma (ICD-0 2 morphologic codes M8052-8082)
 - verrucous carcinoma (M8051)
 - adenocarcinoma (M8140-8580)
 - lymphoma (M9590-9723)
 - Kaposi's sarcoma (M9140)
2. All tumours are graded using the World Health Organization (WHO) tumour grading system,⁶ categorised into 4 groups:
 - grade 1 (well differentiated)
 - grade 2 (moderately differentiated, moderately well differentiated, or intermediate differentiation)
 - grade 3 (poorly differentiated)
 - grade 4 (undifferentiated or anaplastic)

Results

A total of 173 cases of oral cancer were found. The gender and racial distribution are given in Figures 1 and 2.

Age at Diagnosis

Two patients (1.1%) were diagnosed with oral cancer before or at 20 years of age. Between the ages of 21 and 40 years, 14 patients (8.1%) were diagnosed with oral cancer. One-hundred and forty-six patients (84.4%) diagnosed with oral cancer were aged 41 years and above. The dates of birth of 11 patients (6.4%) were not clearly recorded. (Fig. 3).

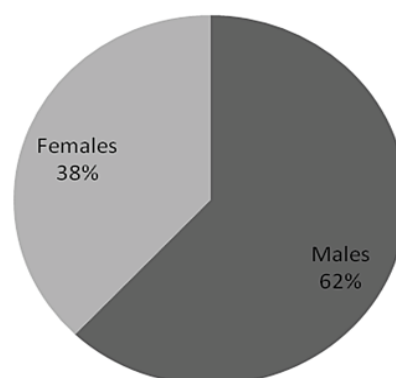


Fig. 1. Chart showing the gender distribution among the oral cancer cases (n = 173).

The youngest patient in our study that was diagnosed with an oral malignancy was 15 years old and the oldest was 94 years of age. The mean and median ages at diagnosis were 60 and 62 years of age respectively.

Types and Site of Cancer

Table 1 depicts the types and numbers of oral malignancies detected in this study. The most common oral malignancy was squamous cell carcinoma (77.5%), followed by salivary gland tumours (9.8%). Spindle cell carcinoma, a variant of the squamous cell carcinoma represented 2.3% of the study population and clear cell carcinoma was found in 1.1% of this cohort. Among the salivary gland tumours, mucoepidermoid carcinoma (5.2%) was the most common followed by adenocarcinoma (2.3%) and adenocystic carcinoma (1.7%).

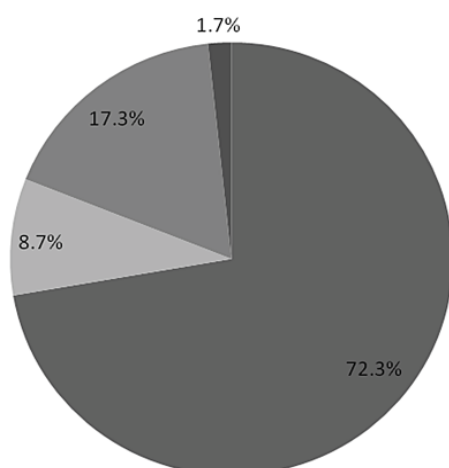


Fig. 2. Chart showing the racial distribution among the oral cancer cases (n = 173).

Sarcomas were found in 4 patients and this represents 2.2% of the study population, of which 2 (1.1%) were osteosarcomas. These sarcomas were found in the oral cavity after radiotherapy to the head and neck region.

Five cases of lymphomas were found in the study. These lymphomas were mainly B-cell lymphoma and it represents 2.9% of our population. Two cases of oral melanomas were noted (1.1%). Metastatic carcinomas from breast, liver, nasopharynx, gastrointestinal tract and unknown primary represented 3.0% of the population. The tumour grading for oral squamous cell carcinomas, according to WHO classification, is shown in Table 2.

Table 2. Distribution of Grading of Oral Squamous Cell Carcinoma

WHO Grading	Number of Subjects	Percentage	Histological Grading
Grade 1	35	26.1%	Well differentiated
Grade 2	82	61.2%	Moderately differentiate
Grade 3	9	6.7%	Poorly differentiated
Grade 4	2	1.5%	Anaplastic. Undifferentiated
Unknown	6	4.5%	
Total	134	100%	

WHO: World Health Organisation

Distribution of patients diagnosed with oral cancer

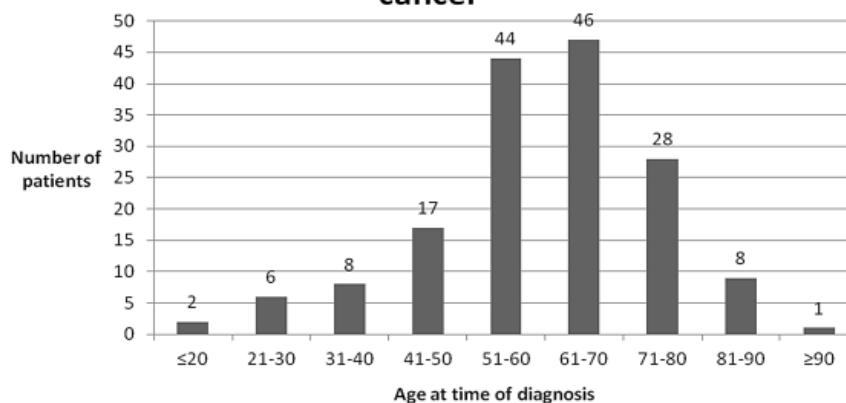


Fig. 3. Chart showing the age distribution among the oral cancer cases (n = 173).

The tongue was the most common site for oral squamous cell carcinomas. Other common areas for oral squamous cell carcinoma include gums, hard palate and cheek (Table 3). Other cancers and their location at time of biopsy are shown in Table 4. Lesions that were not stated included carcinomas in the fauces and chin.

Table 3. Incidence of Squamous Cell Carcinoma at Different Intraoral Sites

Sites of Squamous Cell Carcinoma	Number of Subjects	Percentage
Tongue	27	20.2%
Gums	20	14.9%
Floor of mouth	18	13.4%
Hard palate	28	20.9%
Cheek	17	12.7%
Vestibule	4	3.0%
Retromolar	9	6.7%
Overlapping lesion of mouth	5	3.7%
Intraosseous	1	0.8%
Not otherwise stated	5	3.7%
Total	134	100%

Presenting Complaint

The most common presenting complaint from the patients was swelling in the oral cavity. Other complaints included ulceration, pain from lesions or after dental treatment, and white lesions/patches in the oral cavity. A minority complained of “teeth falling off”, trismus, numbness or swollen lymph nodes (Table 5).

Referral Source

The primary source for oral cancer referrals is mainly from restructured hospitals and government polyclinics which made up close to half of all referrals. Private dental and medical clinics represented 13.8% and 3.4% respectively. A small number of patients (2.3%) noted oral changes themselves and presented without any referrals (Table 6).

Discussion

According to GLOBOCAN, cancers of the oral cavity and lips are the eleventh most common cancer reported globally with a crude rate of 3.9 and age standardised rate of 3.8 per 100,000.⁷ Incidence rates for oral cancer vary in men from 1 to 10 cases per 100,000 populations in many countries. The age standardised incidence rate of oral cancer in India for both genders is reported to be from 0.8 to 10.8 per 100,000 population. It was found that 33.5% of all oral and oropharyngeal cancer reported in the South

Table 4. Other Types of Oral Cancer Manifestation and Their Location

Type of Cancer	Location (Number of Cases)
Spindle cell	Palate (3) Overlapping lesion in the mouth (1)
Mucoepidermoid	Gum (2) Palate (6) Cheek (1)
Adenocystic carcinoma	Floor of mouth (1) Gum (1) Not otherwise stated (1)
Adeoncarcinoma	Floor of mouth (1) Palate (2)
Clear cell carcinoma	Intraosseous (1) Palate (1)
Sarcoma	Gum (1) Intraosseous (1)
Lymphoma	Palate (2) Cheek (2) Vestibule (1)
Melanoma	Overlapping lesion of mouth (2)
Osteosarcoma	Vestibule (1) Intraosseous (1)
Breast	Retromolar (1)
Liver	Gum (1)
Nasopharynx	Palate (1)
Unknown primary	Intraosseous (1)
Gastrointestinal	Retromolar (1)

Table 5. Presentation of Oral Malignancy

Complaints	Number of Subjects
Swelling ± pain	54
Pain	28
Ulcer	23
Leukoplakia	5
Others	8
Total	118

Table 6. Referral Sources

Referral Sources	Number of Cases	Percentage (%)
Self referral	4	2.3
Private dental clinic	24	13.8
Government institution	49	28.3
Polyclinic	37	21.4
Private medical	6	3.5
Not stated	53	30.6
Total	173	100

Asian country were mouth cancer and 43.0% were found in intraoral sites.⁸ Oral cancer is not one of the top 10 most common cancers seen in Singapore. Interestingly, “mouth” cancer was reported as the tenth cancer leading to death among Indians in Singapore from 1998 to 2002; 2.8 males and 2.1 females per 100,000 per year.⁹

This retrospective study showed a small number of patients ($n = 173$) diagnosed with oral cancer over a 11-year period which concurs with low incidence of oral cancer reported by National Cancer Registry in Singapore. This study showed oral cancer is more common among older males, a finding which is consistent with other studies.³ This could be related to the fact that males are more likely to be exposed to risk factors such as smoking and alcohol consumption. National surveys show significantly higher percentages of males who smoke and consume more alcohol than their female counterparts.^{10,11}

Ethnic Chinese formed the majority of this study cohort followed by Indians and Malays. This is in congruence with the population statistics of Singapore which consisted of the majority Chinese. However, this study showed that oral cancer is more common in Indians than in Malays. This is not in congruence with the population distribution. According to the Census of population in 2000, the distribution of ethnicity was 76.8% Chinese, 13.9% Malays, 7.9% Indians and 1.4% of other ethnicity.¹² From Figure 2, it can be seen that there is a greater proportion of patients of Indian ethnicity and of other races being diagnosed with oral cancer at 17.3% and 1.7% respectively in a country where they form only 9.3% of the entire population of Singapore. Our findings concur with statistics from National Cancer Registry of Peninsular Malaysia. With a population of 24.8 million, it made up of 54.3% Malay, 25.1% Chinese, 7.5% Indian and 13.1% others, the registry reported 149 per 100,000 Indian, 108 per 100,000 Malay and 74 per 100,000 Chinese were diagnosed with mouth and tongue cancer.¹³ Among the 3 ethnic groups diagnosed with oral and tongue cancer, 45% were Indians, 32.6% were Malays and 22.4% were Chinese.

A possible reason is that culturally, ethnic Malays tend not to indulge in alcohol, whereas other ethnicities do not have such a restriction. A national health survey in 1998 showed the prevalence of regular alcohol consumption in different ethnic groups was 3.6%, 0.6% and 2.7% for Chinese, Malays and Indians respectively.¹⁰

Contrarily, a significant percentage of Malays do smoke but we do not see a high percentage of Malays having oral cancer. The combination of smoking and alcohol consumption is known to be supermultiplicative in oral cancers.¹⁴ This might explain the discrepancy between the 2 ethnic groups. Moreover, betel nut or quid chewing could be other possible contributing risk factors among older Indian migrants.

In the Chinese population, the most common site for oral malignancy was the hard palate (23.5%), followed by lesion of the mouth not otherwise specified (NOS) (21.8%) and the tongue (17.6%). Similar to the Chinese population, the Malay population was found to have the highest incidence of oral malignancy at the hard palate (29.4%), and lesion of the mouth NOS (23.5%). The cheek and NOS were tied as the most common site (20.7%) in the Indian population.

Collectively, the highest incidence of oral malignancy in this study was the hard palate. This is then followed by tongue, gums, floor of the mouth and cheek mucosa. This is different from the Singapore Cancer Registry 1998-2002 report where the most common sites were tongue, palate (inclusive of hard palate, soft palate and uvula), cheek, floor of the mouth and gums.⁹ One of the reasons for the discrepancy might be that these patients could have problems with their dental prostheses and sought treatment in the National Dental Centre, assuming that it was a dental problem. This is especially true for patients with upper dentures, as these prostheses are fitted onto the hard palate. Any changes to the form of the palate will compromise the fit and function of the denture.

Comparatively, tongue lesions are not commonly viewed as a “dental” problem in the general population. Patients would have sought treatment with their family doctors instead of dentists if their function or speech were affected. This would result in a significant number of malignancies to be referred directly to the otolaryngologist or head and neck surgeons for management.

The most common oral malignancy seen in this study is squamous cell carcinoma and this concurs with most literature.³ However, in most studies, squamous cell carcinoma of the tongue ranked the top in terms of type and site of oral malignancy.¹⁵ This is also in alignment with the incidence data 1998 to 2002 in the Singapore Cancer Registry report where squamous cell carcinoma was found in 94.7% of all tongue cancers recorded in this period.⁹

In this study, squamous cell carcinoma of the tongue and palate both ranked the most common oral malignancy. Some have hypothesised that varying data regarding clinical presentation of oral squamous cell carcinoma may be explained by the type of epithelial origins, namely keratinised masticatory mucosa, non-keratinised lining mucosa and specialised mucosa of tongue. These 3 epithelia have significant differences in their development, structure and function.¹⁶ In our cohort, the prevalence of oral squamous cell carcinoma was about the same in all keratinised and non-keratinised oral epithelia and was higher than tongue epithelia.

Metastasis of malignant tumour to oral tissues is not common. Most reported in the English literature are case reports or series of cases. Those papers with large numbers

are usually reviews of many reports. Thus, it is not surprising that in our review of oral cancer over 11 years we only presented with 6 cases of metastasis to oral tissues. Three out of the 6 cases of metastasis were found to be the first sign of malignancy and the remaining half had known malignancy. Literature showed that the most common primary source of oral metastasis was from the lung for males and the breast for females.¹⁷ In this small cohort, there was 1 from lung and 1 from the breast. It would be interesting to gather more data on this to study if the pattern of metastasis concurs with other reports.

The most common symptoms from self-referred or referred patients were persistent swelling in the mouth. The other common presenting symptoms were pain and ulceration in the mouth. If odontogenic or infective source was ruled out as a causative factor, malignancy should be considered one of the differentials in the diagnosis of these symptoms. When malignancy is confirmed, depending on the type of histological diagnosis; it is critical to have a full workup to ensure that it is not a metastasis. In cases where there is a known primary malignant, it is mandatory to have a biopsy of the lesions in the mouth to exclude malignancy.

Majority of patients in this study were referred from the government or restructured institutions and polyclinics. A significant percentage was referred by private dental practitioners. One study stated that dental practitioners are more likely to refer asymptomatic, early-stage disease for biopsy after routine examination compared to medical practitioners.¹⁸ Due to the fact that treatment of premalignant conditions or early stage carcinoma improves survival significantly, this clearly indicates that dental surgeons play an important role in the detection of oral malignancy.

Conclusion

Although oral cancer is not a common pathology in Singapore, it remains as a disease of high mortality and morbidity. Armed with knowledge of risk factors that increases its incidence, efforts should be directed at the prevention of the disease by en masse education and behavioural modification. Medical and dental professionals would also be required to play an active role in identifying patients at risk and early referrals to institutions to achieve an optimum outcome.

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