RESEARCH ARTICLE

Dentists' Perception of the Role they Play in Early Detection of Oral Cancer

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Abstract

Background: Dentists are typically the first professionals who are approached to treat ailments within the oral cavity. Therefore they should be well-equipped in detecting suspicious lesions during routine clinical practice. This study determined the levels of knowledge on early signs and risk factors associated with oral cancer and identified which factors influenced dentist participation in prevention and early detection of oral cancer. Materials and Methods: A survey on dentists' knowledge and their practices in prevention and early detection of oral cancer was conducted using a 26-item self-administered questionnaire. Results and Conclusions: A response rate of 41.7% was achieved. The level of knowledge on early signs and risk habits associated with oral cancer was high and the majority reported to have conducted opportunistic screening and advised patients on risk habit cessation. Factors that influenced the dentist in practising prevention and early detection of oral cancer were continuous education on oral cancer, age, nature of practice and recent graduation. Notably, dentists were receptive to further training in the area of oral cancer detection and cessation of risk habits. Taken together, the study demonstrated that the dental clinic is a good avenue to conduct programs on opportunistic screening, and continuous education in these areas is necessary to adequately equip dentists in running these programs. Further, this study also highlighted knowledge deficits and practice shortcomings which will help in planning and developing programs that further encourage better participation of dentists in prevention and early detection of oral cancer.

Keywords: Oral cancer - oral cancer awareness - early detection and prevention - dentist - opportunistic screening

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Introduction

Oral cancer is a major cause of morbidity and mortality worldwide. Every year, more than 275,000 new oral cancer cases are diagnosed and at least 120,000 die of the disease (Parkin et al., 2005). The oral cavity is amenable to routine screening and clinical examination for malignant changes, therefore in theory, these changes should be more easily detected and diagnosed in the early stages leading to more effective management (Burzynski et al., 1997; Mignogna et al., 2002). However, despite the easy accessibility of oral cavity for examination, oral cancer remains a highly lethal disease (Speight et al., 2010) and is one of the most debilitating and disfiguring of all malignancies (Mignogna et al., 2004). Notably, in Malaysia, oral cancer is the 2nd most common cause of deaths due to cancer in males, in Malaysian public hospitals (Ministry of Health Malaysia, 1998), a figure that reflects the stage of the tumour at presentation 67% at Stage III and IV; (Doss et al., 2011), the development of loco-regional recurrences and distant metastases.

As the majority of oral cancers are associated with lifestyle risk factors including smoking, betel quid chewing and alcohol consumption, the primary prevention for oral cancer is through health education that aims to change behaviour or lifestyle that are known to be associated with oral cancer. Notably however, the figures concerning the prevention and early detection of oral cancer have remained disappointingly constant over the last few decades and studies reporting the success of primary prevention are limited, underscoring the fact that changing behaviour or lifestyle is a slow and difficult process. In this regard, to significantly reduce the burden of oral cancer, secondary oral cancer prevention i.e. early detection through screening is particularly important (Speight et al., 2010). The potential benefits of screening which include down-staging, improved survival, reassurance (for those screened negative) and decrease cost of treatment are well-established (Rodrigues et al., 1998). A community-based randomised controlled intervention trial to evaluate the efficacy of organised oral cancer screening and intervention programme in

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India demonstrated that multiple rounds of screening was effective in down-staging tumours and reducing oral cancer mortality particularly amongst individuals who are at high risk (Ramadas et al., 2003; Sankaranarayanan et al., 2005; 2013; Brocklehurst et al., 2010). However, this was the only randomised controlled trial in the literature and therefore the real benefits and cost-effectiveness of oral cancer screening remains controversial as other studies reported high rates of false positive referrals and a low yield of oral cancer in the screened population, underlining that there is currently no definitive evidence that public screening of asymptomatic patients can reduced mortality from oral cancer (Kujan et al., 2006b). Therefore, targeting high-risk populations or performing opportunistic screening by trained individuals is an attractive cost-effective way of promoting early detection of oral cancer. Indeed, a national programme on opportunistic oral cancer screening in Cuba has increase the diagnosis of early cancers from 23-49% (Frenandez Garrote et al., 1995). Further, other organisation including the "UK Working Group on Screening for Oral Cancer and Precancer" and the "World Dental Federation (FDI)" have recommended opportunistic screening to reduce mortality from oral cancer.

Dentists are typically the first professionals who are approached to treat ailments within the oral cavity, making them uniquely placed to perform opportunistic screening for oral cancer and to provide advice and counselling interventions during routine examination. In the United Kingdom alone, up to 40% of the population see a dentist for an oral examination every year and general dental practitioners can easily detect relevant lesions using a simple systematic mucosal examination, without disrupting the normal practice routine (Lim et al., 2003). In addition, opportunities exist during a patient's visit to a dental clinic for risk habit intervention services as it is well established that dental patients are traditionally receptive to preventive health messages and further, as some risk factors including smoking and betel quid chewing leave oral effects, visible evidence of the benefits of cessation can serve as a strong motivation for patients to quit (Tomar, 2001).

In Malaysia, the National Oral Health Survey of Adults (NOHSA) from the Ministry of Health has shown that up to a third of the population see their dentists at least once every 6 months (NOHSA, 2000). Further, based on the Malaysian Dental Council Annual Statistics 2011, there are 4,289 practising dentists in Malaysia who have the potential to play a major role in implementing oral cancer prevention and early detection measures. Taken together, the dental clinic is an attractive option for conducting programmes on prevention and early detection of oral cancer. However, a good understanding of perceptions, attitudes and practices of dentists is crucial in determining their effectiveness in implementing these programmes (Horowitz et al., 1996). Therefore in this study, we conducted a survey to determine the dentists' perception of their role in promoting prevention and early detection of oral cancer and to measure current practices in dental clinics with regards to these areas. We also identified the motivation and barriers that are associated with the practice of prevention and early detection of oral cancer by dentists. This study provided information on current practices and perceptions of dentists that have hitherto not been reported in this region. More importantly, the findings of this study will help us facilitate better participation of dentists in preventing and detecting oral cancers early which would ultimately benefit the healthcare system as a whole and improve survival of oral cancer patients.

Materials and Methods

A 26-item self-administered questionnaire was constructed to obtain information and to measure the level of knowledge based on the following subheadings: *i*) general information on dentist, *ii*) early detection of oral cancer, *iii*) risk habits associated with oral cancer, and *iv*) perception of dentists on training in the area of oral cancer. The survey was developed from previously published tools (Yellowitz et al., 2000; Macpherson et al., 2003; Kujan et al., 2006a; Decuseara et al., 2011) with modifications to suit the local population, particularly in the area of risk factors associated with the disease. The questionnaire was first validated (face and content) by a group of 20 dentists who are practising in clinics both in the public (government and universities) and private settings. The validated questionnaires were distributed to 988 practising dentists in Malaysia who attended two major dental conferences organised by the Malaysian Dental Association (MDA) held in Kuala Lumpur and in Kota Kinabalu, Sabah, Malaysia. The sample size for this study was calculated using a single proportion formula, based on the proportion of awareness among adults in Malaysia of 80% (Saleh et al., 2012) at the precision of 5% giving a total of 245 subjects. Pearson's chi-square and Kruskal-Wallis tests were conducted to evaluate the association between dentists' background [gender, year and country/region of graduation, participation in continuous medical education (CME)] and their knowledge and practice of early detection and prevention of oral cancer (knowledge on early signs and symptom, knowledge on risk factors, conducting opportunistic screenings and providing risk habits cessation). p values <0.05 was considered to be statistically significant. All the tests were performed using the statistical software SPSS version 16. This study was approved by the Medical Ethics Committee at the Sime Darby Healthcare (Ethics Reference Number: 201212.21).

Results

Study cohort

Nine hundred and eighty eight (988) questionnaires were given out as detailed above and from these, 412 questionnaires were returned, giving rise to a response rate of 41.7%. Fifty questionnaires were excluded from the analysis as they were incomplete, therefore only 362 questionnaires were analysed. The respondents consisted of 115 males (31.8%) and 247 females (68.2%) and we had a good representation from dentists working in the public and private sectors (50.3% and 48.6% respectively; Table 1) which is representative of the Malaysian statistics, as reported by Malaysian Dental Council (2011). More than

half of the respondents (50.8%) graduated at least 10 years ago (Table 1).

Knowledge on early signs of oral cancer and conducting opportunistic screening

When dentists were asked to evaluate their ability to recognise early signs and symptoms of oral cancer, 35.6% thought that they are well informed and were equipped to recognise the early signs and symptoms of oral cancer. The majority of dentists (61.9%) thought that they were reasonably informed while only 1.1% of dentists thought that they were poorly informed and were not able to recognise the signs of oral cancer. This data was consistent with their ability to correctly pick the possible signs and symptoms of oral cancer from a list, where nearly all dentists knew that red/white patches (93.1%) and ulcers that do not heal (97%) could be early signs of oral cancer. However, a drop in the percentage of dentists (67.1%) knew that bleeding gums is not an early sign for oral cancer (Figure 1).

Oral mucosal examination has been found to be a sensitive and specific test for the detection of oral cancer particularly when it is conducted by trained health practitioners (Stewart and Kleihues, 2003; Sankaranarayanan et al., 2005). In this study, the majority of dentists (84.8%) reported to have conducted opportunistic oral cancer examination frequently at their clinics (Table 2). Notably, when the level of confidence in conducting opportunistic oral cancer examination was compared with the frequency of conducting the examination, we found that there was a direct correlation between confidence level and the frequency of oral examination ($p<0.001$; Table 2). Further, the level of confidence of dentists was associated with the nature of practice, recency of graduation and attending CME on oral cancer ($p<0.05$ data not shown). In line with oral cancer examination, we consistently found that a high percentage of dentists were aware of the mouth self-examination technique (MSE; 92.8%) and more than half of these dentists have reported to teach their patients to perform MSE for early detection of oral cancer. Among dentists who currently do not discuss MSE with their patients, the main reasons cited were not having enough time (39.1%) and patients are not interested (12.5%). Notably, a minority of the dentists thought that mouth self-examination is not necessary for oral cancer prevention and early detection (9.4%) and a further 6.3% did not want to alarm their patients. Further, there were also dentists who taught MSE only to high-risk individuals (6.3%) and a small percentage reported to have discussed MSE only in conjunction with a cancer awareness programme (3.1%).

Table 1. Selected Demographics of Malaysian Dentists in the Study

		Frequency	%
Gender	Female	247	68.2
	Male	115	31.8
Age	≤ 30 yrs old	127	35.1
	31-40 yrs old	95	26.2
	41-50 yrs old	72	19.9
	51-60 yrs old	55	15.2
	61-70 yrs old	10	2.8
	71-80 yrs old	3	0.8
Nature of clinical practice	Private	176	48.6
	Public: University	25	6.9
	Public: Government	157	43.4
	Others*	4	1.1
Country/Region of graduation	Malaysia	262	72.4
	Asia	65	18
	Oceanic	15	4.1
	United Kingdom	10	2.8
	Others**	10	2.8
Recency of graduation	≤ 10 yrs ago	184	50.8
	11-20 yrs old	87	24
	21-30 yrs old	65	18
	> 30 yrs ago	26	7.2
Practice dentistry	Yes, currently	346	95.6
	Yes, previously	16	4.4
Completed post-grad training	Yes	78	21.5
	No	284	78.5
No. of CME attended	0	12	3.3
(last 5 years)	1 to 5	53	14.6
	5 to 10	79	21.8
	11 to 25	108	29.8
	> 25	110	30.4
No. of CME attended	0 (Oral Cancer only: last 5 years)	96	26.5
	1 to 5	244	67.4
	> 5	22	6.1
No. of patients treated on annual basis among currently practising dentist			
	< 1000	33	9.5
	1001 to 3000	115	33.2
	3001 to 5000	128	37
	> 5000	70	20.2

*Others: Dentists that practised in both private and public setting; **Others including countries such as Iraq, Jordan, Cairo, U.S.A, Canada and Germany

Table 2. Conducting Oral Cancer Examination: Frequency and Level of Confidence amongst Dentists.

Level of Confidence	Always (%)	Occasionally (%)	Seldom (%)	Never (%)	Total	p value
Confident	113 (95.0)	156 (85.7)	21 (47.7)	3 (30)	293	< 0.001
Not confident	6 (5.0)	26 (14.3)	23 (52.3)	7 (70)	62	
Total	119 (33.5)	182 (51.3)	44 (12.4)	10 (2.8)	355 (100.0)	

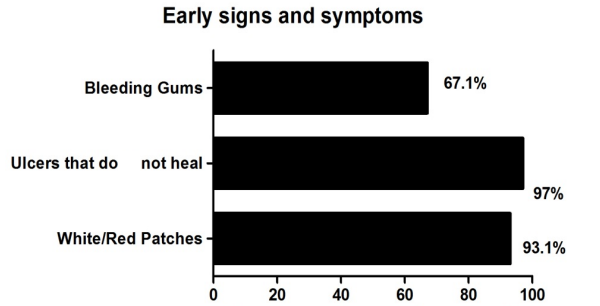

Figure 1. Knowledge of Early Signs and Symptoms of Oral Cancer among Dentists

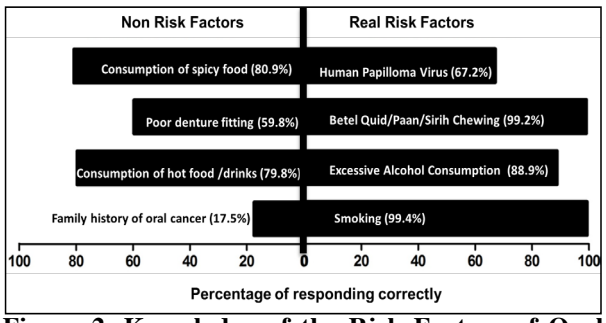

Figure 2. Knowledge of the Risk Factors of Oral Cancer among Dentists

Knowledge on risk habits of oral cancer

When dentists were asked to evaluate their knowledge on oral cancer habits, 45.7% thought that they are well informed and know all the risk habits associated with oral cancer while 53.2 % of dentists thought they were reasonably informed and know some risk habits. Only 1.1% of dentists thought that they were poorly informed and were not sure what risk habits are associated with oral cancer. Figure 2 showed that the majority of dentists were able to identify the most obvious risk factors including smoking, betel quid/paan chewing and excessive alcohol consumption (99.4%, 99.2% and 88.9% respectively). However only 67.2% of dentists knew that human papilloma virus (HPV) was a risk factor for oral cancer and 17.5% of dentists correctly identified 'family history of oral cancer' not to be a risk factor.

Providing oral cancer risk habits cessation advice

Dental patients are particularly receptive to health messages at regular checkups and as the oral effects of tobacco/betel quid use provide visible evidence and a strong motivation for these users to quit, the dental clinic provides an excellent avenue for providing tobacco intervention services. It is therefore heartening to know that more than 80% of the dentists reported to have provided advice to their patients to stop smoking,

Table 3. Advice on Risk Habits Cessation: Frequency and Level of Confidence

		Provide advice (%)	Do not provide advice (%)	I do not know if patients practise these risk habits (%)	I do not believe that dentist play a role in providing such advice (%)	Total	p value
Smoking	Confident	221 (77.8%)	21 (41.2%)	6 (50.0%)	1 (50.0%)	249	<0.001
	Not confident	63 (22.2%)	30 (58.8%)	6 (50.0%)	1 (50.0%)	100	
	Total	284 (81.4%)	51 (14.6%)	12 (3.4%)	2(0.6%)	349 (100.0%)	
Excessive alcohol drinking	Confident	192 (70.1%)	19 (37.3%)	5 (41.7%)	0 (0.0%)	216	<0.001
	Not confident	82 (29.9%)	32 (62.7%)	7 (58.3%)	1(100.0%)	122	
	Total	274 (81.1%)	51 (15.1%)	12 (3.6%)	1 (0.2%)	338 (100%)	
Betel quid/paan chewing	Confident	235 (82.5%)	22 (42.3%)	6 (46.2%)	1 (50.0%)	264	<0.001
	Not confident	50 (17.5%)	30 (57.7%)	7 (53.8%)	1 (50.0%)	88	
	Total	285 (81.0%)	52 (14.8%)	13 (3.7%)	2 (0.5%)	352 (100.0%)	

*Data was analysed by Kruskal-Wallis test, p<0.05 is considered significant

Table 4. Effect of Selected Background Characteristics on General Dentists' Knowledge and Application of Early Detection and Prevention of Oral Cancer

	Early detection				Prevention	
	Correct signs and symptoms	Oral cancer screening	Know MSE	Teach MSE	Correct risk habits	Advise patients to stop risk habits
Gender	0.002	NS	NS	0.031	NS	0.016
Age group	0.001	NS	0.049	NS	NS	NS
Nature of clinical practice	0.02	0.015	0.003	0	NS	NS
Graduation country	0.005	NS	0.01	NS	NS	NS
Recency of graduation	0.002	0.009	0.014	0.026	NS	NS
Post graduate status	NS	NS	NS	NS	NS	NS
CME (Oral cancer, frequency/year)	NS	0	0	0	NS	NS
CME (Oral cancer, attended/not attended)	NS	0	0	0	NS	NS
No. of patients	NS	NS	NS	NS	NS	NS

*NS: Not significant

Table 5. Confidence Level and Training Required

a) Dentist conducting oral cancer examination and confidence level and training required

Level of confidence	*Conduct Oral Cancer Examination			**Do not conduct Oral Cancer Examination		
	No. (%)	Yes to training (%)	No. to training (%)	No. (%)	Yes to training (%)	No to training (%)
Confident	269 (89.4)	192 (71.4)	76 (28.3)	24 (44.4)	18 (75.0)	6 (25.0)
Not confident	32 (10.6)	27 (84.4)	5 (15.6)	30 (55.6)	26 (86.7)	4 (15.4)
Total	301 (100.0)			54 (100.0)		

b) Dentist providing advice and confidence level and training required

Type of advice	Confidence level		Provide advice		Do not provide advice		
		Total (%)	Yes to training (%)	No. to training (%)	Total (%)	Yes to training (%)	No. to training (%)
Stop smoking	Confident	220 (77.7)	123 (55.9)	97 (44.1)	21 (41.2)	12 (57.1)	9 (42.9)
	Not confident	63 (33.3)	43 (68.3)	20 (31.7)	30 (58.8)	16 (53.3)	14 (46.7)
	Total	283 (100.0)			51 (100.0)		
Stop drinking excessive alcohol	Confident	191 (70.0)	97 (50.8)	94 (49.2)	19 (37.3)	6 (31.6)	13 (68.4)
	Not confident	82 (30.0)	49 (59.8)	33 (40.2)	32 (62.7)	13 (40.6)	19 (59.4)
	Total	273 (100.0)			51 (100.0)		
Stop betel quid/paan chewing	Confident	234 (82.4)	117 (50.0)	117 (50.0)	22 (42.3)	7 (31.8)	15 (68.2)
	Not confident	50 (17.6)	31 (62.0)	19 (38.0)	30 (57.7)	14 (46.7)	16 (53.3)
	Total	284 (100.0)			52 (100.0)		

*Include dentists who answered "Always" and "Occasional"; **Include dentists who answered "Seldom" and "Never"

Table Supplementary. This is a Supplemenatry Table and Not to Be Included in the Manuscript and Can Be Made Avalaible at the Journal Website

		Correct signs and symptoms			OC screening			Know MSE			Teach MSE			Correct risk habits			Risk habit cessation advice				
		Wrong	Correct	p value	Never/ Seldom	Always/ Occassionally	p value	No	Yes	p value	No	Yes	p value	Wrong	Correct	p value	No	Yes	I do not know if my patients practise these risk habits	I do not believe that dentists play a role in providing such advice	p value
Age	<31	45 (35.4)	82 (64.6)	0.001Φ*	11 (8.7)	116 (91.3)	0.171Φ	4 (3.1)	123 (96.9)	0.049Φ*	31 (27.0)	84 (73.0)	0.071Φ	124 (97.6)	3 (24.0)	0.488Φ	9 (7.1)	115 (90.6)	3 (2.4)	0 (0.0)	0.560Φ
	31-40	30 (31.9)	64 (68.1)		16 (17.0)	78 (83.0)		12 (12.6)	83 (87.4)		29 (39.2)	45 (60.8)		90 (94.7)	5 (5.3)		18 (19.1)	68 (72.3)	8 (8.5)	0 (0.0)	
	41-50	30 (41.7)	42 (58.3)		14 (19.4)	58 (80.6)		5 (7.0)	66 (93.0)		25 (41.0)	36 (59.0)		66 (91.7)	6 (8.3)		13 (18.1)	56 (77.8)	2 (2.8)	1 (1.4)	
	51-60	31 (57.4)	23 (42.6)		11 (20.8)	42 (79.2)		4 (7.3)	51 (92.7)		20 (51.3)	19 (48.7)		52 (94.5)	3 (5.5)		11 (20.4)	40 (74.1)	1 (1.9)	2 (3.7)	
	61-70	8 (80.0)	2 (20.0)		1 (10.0)	9 (90.0)		0 (0.0)	10 (100.0)		4 (40.0)	6 (60.0)		10 (100.0)	0 (0.0)		1 (10.0)	90 (90.0)	0 (0.0)	0 (0.0)	
	>70	2 (100.0)	0 (0.0)		1 (33.3)	2 (66.7)		1 (33.3)	2 (66.7)		0 (0.0)	2 (100.0)		3 (100.0)	0 (0.0)		1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	
Gender	Female	86 (35.1)	159 (64.9)	0.002†*	35 (14.3)	210 (85.7)	0.557†	17 (6.9)	230 (93.1)	0.730†	67 (32.2)	141 (67.8)	0.031†*	237 (96.0)	10 (4.0)	0.393†	26 (10.6)	207 (84.5)	10 (4.1)	2 (0.8)	0.016Φ*
	Male	60 (52.6)	54 (47.4)		19 (16.7)	95 (83.3)		9 (7.9)	105 (92.1)		42 (45.2)	51 (54.8)		108 (93.9)	7 (6.1)		27 (23.5)	83 (72.2)	4 (3.5)	1 (0.9)	
Nature of clinical practice																					
	Private	83 (48.0)	90 (52.0)	0.020Φ*	35 (19.9)	141 (80.1)	0.015Φ*	20 (11.4)	155 (88.6)	0.003Φ*	66 (49.3)	68 (50.7)	<0.001Φ*	164 (93.2)	12 (6.8)	0.174Φ	40 (23.0)	120 (69.0)	11 (6.3)	3 (1.7)	0.063Φ
	Uni and Public	61 (33.5)	121 (66.5)		19 (10.6)	160 (89.4)		5 (2.7)	177 (97.3)		42 (25.6)	122 (74.4)		177 (97.3)	5 (2.7)		12 (6.6)	167 (91.8)	3 (1.6)	0 (0.0)	
	Both	2 (50.0)	2 (50.0)		0 (0.0)	4 (100.0)		1 (25.0)	3 (75.0)		1 (33.3)	2 (66.7)		4 (100.0)	0 (0.0)		1 (25.0)	3 (75.0)	0 (0.0)	0 (0.0)	
Graduation Country																					
	Malaysia	91 (34.9)	170 (65.1)	0.005Φ*	33 (12.6)	228 (87.4)	0.107Φ	18 (6.9)	243 (93.1)	0.010Φ*	72 (32.9)	147 (67.1)	0.117Φ	250 (95.4)	12 (4.6)	0.115Φ	33 (12.6)	216 (82.8)	10 (3.8)	2 (0.8)	0.786Φ
	Asia	37 (58.7)	26 (41.3)		13 (20.3)	51 (79.7)		2 (3.1)	63 (96.9)		24 (42.9)	32 (57.1)		64 (98.5)	1 (1.5)		10 (15.6)	54 (84.4)	0 (0.0)	0 (0.0)	
	UK	4 (40.0)	6 (60.0)		1 (10.0)	9 (90.0)		0 (0.0)	10 (0.0)		4 (40.0)	6 (60.0)		9 (90.0)	1 (10.0)		2 (20.0)	8 (80.0)	0 (0.0)	0 (0.0)	
	Oceanic	8 (53.3)	7 (46.7)		5 (35.7)	9 (64.3)		4 (26.7)	11 (73.3)		6 (75.0)	2 (25.0)		14 (93.3)	1 (6.7)		5 (33.3)	7 (46.7)	3 (20.0)	0 (0.0)	
	Others	6 (60.0)	4 (40.0)		2 (20.0)	8 (80.0)		2 (20.0)	8 (80.0)		3 (37.5)	5 (62.5)		8 (80.0)	2 (20.0)		3 (30.0)	5 (50.0)	1 (10.0)	1 (10.0)	
Recency of graduation																					
	<11	62 (33.7)	122 (66.3)	0.002†*	17 (9.2)	167 (90.8)	0.009†*	8 (4.3)	176 (95.7)	0.014Φ*	46 (28.6)	115 (71.4)	0.026†*	178 (96.7)	6 (3.3)	0.225Φ	18 (9.6)	164 (87.2)	6 (3.2)	0 (0.0)	0.279Φ
	11-20	33 (38.4)	53 (61.6)		21 (24.4)	65 (75.6)		13 (14.9)	74 (85.1)		31 (43.7)	40 (56.3)		81 (93.1)	6 (6.9)		18 (20.2)	64 (71.9)	6 (6.7)	1 (1.1)	
	21-30	35 (54.7)	29 (45.3)		12 (18.8)	52 (81.3)		3 (4.7)	61 (95.3)		23 (48.9)	24 (51.1)		60 (92.3)	5 (7.7)		13 (22.4)	41 (70.7)	2 (3.4)	2 (3.4)	
	>30	16 (64.0)	9 (36.0)		4 (16.0)	21 (84.0)		2 (7.7)	24 (92.3)		9 (40.9)	13 (59.1)		26 (100.0)	0 (0.0)		4 (16.0)	21 (84.0)	0 (0.0)	0 (0.0)	
Attended post-graduate course																					
	Attended	112 (39.9)	169 (60.1)	0.553†	42 (14.8)	241 (85.2)	0.837†	20 (7.1)	263 (92.9)	0.850†	82 (34.6)	155 (65.4)	0.262†	272 (95.8)	12 (4.2)	0.380Φ	39 (13.8)	232 (82.0)	10 (3.5)	2 (0.7)	0.613Φ
	Never attended	34 (43.6)	44 (56.4)		12 (15.8)	64 (84.2)		6 (7.7)	72 (92.3)		27 (42.2)	37 (57.8)		73 (93.6)	5 (6.4)		14 (18.2)	58 (75.3)	4 (5.2)	1 (1.3)	
Frequency of attendance of CME on oral cancer/year																					
	0	37 (39.4)	57 (60.6)	0.070†	27 (28.4)	68 (71.6)	<0.001†*	19 (19.8)	77 (80.2)	<0.001†*	37 (56.9)	28 (43.1)	<0.001†*	90 (93.8)	6 (6.3)	0.456Φ	23 (24.2)	61 (64.2)	9 (9.5)	2 (2.1)	0.617Φ
	≤ 1	105 (43.2)	138 (56.8)		25 (10.3)	217 (89.7)		6 (2.5)	237 (97.5)		68 (31.3)	149 (68.7)		234 (95.9)	10 (4.1)		28 (11.5)	209 (86.0)	5 (2.1)	1 (0.4)	
	> 1	4 (18.2)	18 (81.8)		2 (9.1)	20 (90.9)		1 (4.5)	21 (95.5)		4 (21.1)	15 (78.9)		21 (95.5)	1 (4.5)		2 (9.1)	20 (90.9)	0 (0.0)	0 (0.0)	
Attendance of CME on oral cancer																					
	Never attended	37 (39.4)	57 (60.6)	0.764†	27 (28.4)	68 (71.6)	<0.001†*	19 (19.8)	77 (80.2)	<0.001†*	37 (56.9)	28 (43.1)	<0.001†*	90 (93.8)	6 (6.3)	0.405Φ	23 (24.2)	61 (64.2)	9 (9.5)	2 (2.1)	0.326Φ
	Attended	109 (41.1)	156 (58.9)		27 (10.2)	237 (89.8)		7 (2.6)	258 (97.4)		72 (30.5)	164 (69.5)		255 (95.9)	11 (4.1)		30 (11.3)	229 (86.4)	5 (1.9)	1 (0.4)	
Number of patients/day																					
	≤ 10	61 (40.7)	89 (59.3)	0.919†	25 (16.7)	125 (83.3)	0.479†	13 (8.6)	138 (91.4)	0.455†	48 (38.7)	76 (61.3)	0.505†	145 (96.0)	6 (4.0)	0.655†	22 (14.7)	119 (79.3)	9 (6.0)	0 (0.0)	0.178Φ
	>10	82 (41.2)	117 (58.8)		28 (13.9)	173 (86.1)		13 (6.5)	187 (93.5)		59 (34.9)	110 (65.1)		191 (95.0)	10 (5.0)		29 (14.5)	163 (81.5)	5 (2.5)	3 (1.5)	

**p value < 0.05 is considered significant, OC= Oral cancer, MSE= Mouth self examination, Data were analysed by Kruskal Wallis testΦ or Pearson's Chi-Square test † or Fisher's exact test Φ

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excessive drinking of alcohol and betel quid/paan chewing (81.4%, 81.1% and 81.0% respectively). Less than 4% of dentists reported not to know of the risk habits associated with their patients and only 0.6% believed that it is not their role to provide cessation advice to patients (Table 3). Again, there was a significant association between the levels of confidence with respect to how often a dentist would give advice to their patients on risk habit cessation ($p<0.001$).

Dentists who were confident provided advice more frequently to their patients on the three risk habits: smoking, excessive alcohol drinking and betel quid/paan chewing (77.8%, 70.1% and 82.5% respectively) compared to dentists who were less confident (22.2%, 29.9% and 17.6% respectively; Table 3). The level of confidence on providing cessation advice was associated with nature of practice, recency of graduation and attending CME on oral cancer ($p <0.05$; data not shown).

Factors affecting knowledge and participation in early detection and prevention of oral cancer

We found that knowledge on early signs and symptoms of oral cancer were significantly associated with age, gender, nature of clinical practice and recency of graduation (Table 4). Dentists who could identify the correct early signs and symptoms of oral cancer were most often those who are female and those in the age group of 31-40 years old. Further, dentists practising in the public sector (government and universities) and those who graduated less than 10 years ago were more knowledgeable in the area of early signs and symptoms of oral cancer (Table Supplementary).

The factors that were associated with whether or not dentists conduct opportunistic screening for oral cancer by oral examination, were the nature of clinical practice, recency of graduation and attending CME on oral cancer (including the frequency; Table 4). Not surprisingly, the analysis is mainly weighted towards dentists practising in public sector (government and universities), those who graduated recently (≤ 10 years) and those who attended CME courses on oral cancer (Table Supplementary). These were the same factors that were associated with knowledge on mouth self-examination and teaching patients to conduct MSE (Table 4 and Supplementary). Interestingly, we did not find any significant factors that were associated with knowledge on risk habits, and gender was the only significant factor associated with providing risk habits cessation advice, where female dentists were the majority who reported to have provided advice to their patients.

Receptiveness to oral cancer education and training

When we analysed dentists' perception to training and further education, notably we found more than 70% wanted further/continuous training regardless of whether they currently conduct oral examination for oral cancer, and independent of their confidence level (Table 5a). For those who currently provide risk habit cessation advice, the majority of dentists still perceived training to be important regardless of their confidence levels. Interestingly however, among those who currently do not provide such advice to their patients, the majority of these dentists think that they do not require further training particularly in the area related to alcohol and betel quid cessation (Table 5b).

Discussion

It is well established that virtually all oral cancer are preceded by visible changes in the oral mucosa (Mignogna et al., 2004) and therefore a comprehensive oral cancer examination and risk habits assessment are among the measures that lead to prevention and early detection of oral cancer (Gajendra et al., 2006). Having appropriate knowledge on risk factors and the ability to recognise oral cancer is a prerequisite for dentists providing appropriate information and oral examination. In this study, we found that dentists have a reasonable level of knowledge on the early signs and symptoms of oral cancer. Red/white patches and ulcers that do not heal were easily recognised by dentists however, dentists were unsure whether bleeding gums was a sign of oral cancer (Table 1). Interesting, this was consistent with the results of a survey on the general population in Malaysia, where many wrongly identified bleeding gums as one of the early signs and symptoms of oral cancer (Saleh et al., 2012), indicating that there is room for improvement in educating both the dental practitioners and the general public in this area. With regards to risk factors that are associated with oral cancer, the majority of the dentists in this study perceived themselves as having adequate knowledge on risk factors. Indeed, the majority could identify smoking, excessive alcohol drinking and betel quid chewing as the major risk habits. However, dentists were much less certain about factors that do not pose a risk such as family history of oral cancer and poor denture fitting. In addition, knowledge on emerging risk habits such as HPV require further reinforcement, and could be topics to be included in continuous education programmes for oral cancer. Notably, a high number of dentists reported to have conducted visual oral cancer examination during routine dental practice indicating the sense of responsibility and interest of dentists in playing a role in early detection of the disease (Table 2). This was consistent with the fact that only 0.6% of dentists in this study do not think they have a role in prevention of oral cancer and in line with studies from the UK and United States of America (USA) where a high percentage of dentists do conduct oral cancer examination within their practice (83-91.3%) (Warnakulasuriya and Johnson, 1999; Horowitz et al., 2000; Gajendra et al., 2006; LeHew et al., 2010). Interestingly a small percentage of dentists conduct mouth cancer examination only in conjunction with Mouth Cancer Awareness week suggesting that such annual events that have been conducted in Malaysia since 2006 could encourage dentists to carry out early detection of oral cancer and further indicate that these events should be continued in more regular intervals through-out the year to encourage such practices (http://mouthcancermalaysia.um.edu.my/).

It is well-established that oral cancer is largely related to lifestyle and as health care providers, dental

practitioners should be well aware of these factors and further, play a central role in providing information about the benefits that could result from the changing of lifestyle habits (Cruz et al., 2005). However, a large percentage of the dentists in UK, Ireland, Europe and USA found providing tobacco and alcohol cessation advice to their patients challenging (Warnakulasuriya and Johnson, 1999; Horowitz et al., 2000; Alonge and Narendran, 2003; Cruz et al., 2005; Kujan et al., 2006a; Applebaum et al., 2009; Decuseara et al., 2011) and further perceived themselves insufficiently trained to incorporate these interventions within their practices (Decuseara et al., 2011). In this study, up to 80% of the dentists reported to have provided cessation advice to their patients indicating that they feel responsible, and want to be actively involved in oral cancer prevention not only through early detection but also through cessation of risk habits. This is heartening to know, as the mortality and morbidity of oral cancer can only be significantly reduced through education of the risk posed by tobacco, betel quid chewing and alcohol abuse in addition to parallel programs on oral cancer examination (Cruz et al., 2005).

Notably, we observed a direct correlation between the level of confidence in either conducting an oral examination or advising patients to stop risk habits with the frequency by which these were performed by the dentists. This strongly suggests that dentists would participate in prevention and early detection programmes if they are comfortable with their level of knowledge in these areas. Further, the confidence levels of individual dentists are strongly influenced by whether or not they attended CME on oral cancer (data not shown). Taken together, CME on oral cancer would boost the confidence of dentists in performing oral cancer examination and increase their knowledge about cessation of risk habit reinterating the fact that with adequate training, dentists should be able to integrate primary and secondary prevention as part of their dental practice.

Considering the mouth is easily accessible for mouth self-examination (MSE), MSE has been advocated for early detection (Glass et al., 1975; Scully et al., 1986; Scott et al., 2010). Our current understanding is that MSE is highly specific but lacks sensitivity, and its utility in increasing survival remains inconclusive (Mathew et al., 1995; Scott et al., 2010; Elango et al., 2011). However, this may be a reflection of the fact that only a limited number of studies have been conducted on the effectiveness of MSE in increasing survival. Studies have shown that the detection rates of oral cancer through MSE compared favourably with detection rates using trained health workers (Mathew et al., 1995; Elango et al., 2011) and MSE has the potential to empower patients by giving them an active role in early detection of cancer. Moreover, follow-up studies have indicated that there is a substantial degree of continued self-examination at home (Grabau et al., 1978) suggesting that this could be a sustainable mechanism for detecting oral cancer early, and certainly serves as a strong argument for the need to systematically evaluate the potential of MSE in improving oral cancer survival rates. In this study, we found that majority of our dentists know MSE and are willing to teach their patients the technique. Notwithstanding the continuing debate, the discussion on MSE between dentist and patient may serve as a talking point to increase the awareness of the disease. Indeed, health education using MSE brochure alone has increased oral cancer awareness in a rural high-risk population in India to over 80% (Elango et al., 2011) suggesting that MSE remains a useful tool to increase overall awareness of the disease.

The knowledge and perception of dentists in prevention and early detection of oral cancer can be dependent of several factors. This study has indicated that 3 main factors that significantly affect dentists' knowledge and whether they perform intervention on early detection and prevention of oral cancer. The most influential factor was the nature of clinical practice, where dentists working in the public setting have significantly more knowledge on oral cancer and a larger number participate actively in oral cancer prevention and early detection activities compared to those in the private sector. This is probably due to the fact that most cancer awareness campaigns and studies have been conducted within government institutes and universities. Furthermore, dentists practising in the public setting may have better opportunities for continuous education and are in a more conducive environment to take time off from direct patient care to engage in continuous education as compared to those in the private setting. In addition, the public sector may provide easier access to referral resources for patient behaviour change encouraging more dentists in the public sector to intervene with risk habit cessation. The second factor that was associated with the level of knowledge was recency of graduation. This finding is consistent with several reported studies (Yellowitz et al., 2000; Patton et al., 2006; Applebaum et al., 2009) and suggests that the current dental curriculum provide reasonable coverage in the area of oral cancer prevention and detection. However, as expected, the level of knowledge decreases with time with the reported half-life of such knowledge of approximately five years (Lindsay et al., 1974), underscoring the importance and the need for continuing professional education in oral cancer prevention (Decuseara et al., 2011).

It is well established that dentists' knowledge, attitudes and practices are positively influenced by continuous education courses (Silverman and Rankin, 2010) therefore, it is not surprising that continuous medical education (CME) in the area of oral cancer is a strong influence in motivating dentist to conduct oral examination for oral cancer and to discuss MSE with their patients. In fact, it has been reported that dentists who had attended a continuous education course within the past year scored higher on diagnostics and risk related knowledge on oral cancer (Hertrampf et al., 2010). The need for CME is also increased by changes in scientific knowledge, advances in tools for early detection and changes in the pattern of oral cancer incidence that is associated with emerging risk factors (LeHew et al., 2010). With the increasing number of oral cancer among younger individuals with no established risk habits (Harris et al., 2010) and with the emergence of new risk factors such as human papilloma virus (HPV) infection (Gillison, 2007; Sturgis and Cinciripini, 2007), it is clear that high risk individuals

are not limited to only those who are associated with traditional risk factors and therefore awareness amongst primary healthcare professionals including dentists will be crucial particularly in detecting the disease early. Many dentists in this study expressed their interest in furthering their education and training in oral cancer, which is consistent with other published reports (McCunniff et al., 2000; Yellowitz et al., 2000; Canto et al., 2002; Horowitz et al., 2002; Applebaum et al., 2009) and this study provided clues on the areas that require focus during these CME and we anticipate that these programmes for dentists will go a long way to enhance the prevention and early detection of oral cancer.

This study achieved a response rate of 41.7%, which is a relative high response rate compared to other similar studies where response rates were between 14% to 68% (Macpherson et al., 2003; Gajendra et al., 2006; Kujan et al., 2006a; Ariyawardana and Ekanayake, 2008; Colella et al., 2008; LeHew et al., 2010; Decuseara et al., 2011; Klosa et al., 2011). The strength of the study lies in the fact that we had participation from 10% of practising dentist and that the study population was representative of the demographics of dentists from Malaysia. We acknowledged the limitation of self-reporting surveys, where dentists may have a tendency to provide socially acceptable responds that may not necessarily reflect their daily professional practice, and this could not be assessed within this study. However, the anonymous nature of the questionnaire should have minimised this type of information error. We also recognised that positive selection bias might have come into play in this study, and that the present respondents were particularly interested in the topic and may be more knowledgeable than non-respondents (American Cancer Society, 1990; Brownson et al., 1993) and thus the data from the survey may reflect higher levels of knowledge and participation in prevention and early detection of oral cancer compared to that of a general pool of dental practitioners.

In summary, the majority of the dentists appeared to have good knowledge of the early signs and symptoms and the main risk habits of oral cancer. There is a direct association between level of confidence among dentists and the frequency of performing oral examination and providing risk cessation advice. Notably, the majority of the dentists in this study are open and receptive to training, independent of their confidence level in areas related to early detection and prevention of oral cancer. With this basis, we believe that more education programmes for dentists would serve to address the knowledge deficits and practice shortcomings with regards to oral cancer screening for early detection and disease prevention. Taken together, the dental clinic is a good avenue to conduct programmes on prevention and early detection of oral cancer however, training in these areas to increase the knowledge and confidence amongst dentists is important for these to be effective. The present findings will stimulate the development and implementation of advanced continuous education programmes for dentists in Malaysia particularly in the area of recognising early signs and symptoms and information on emerging risk factors associated with oral cancer development.

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