



King Saud University  
The Saudi Dental Journal

www.ksu.edu.sa  
www.sciencedirect.com



ORIGINAL ARTICLE

# Dental practitioner's knowledge, opinions and methods of management of oral premalignancy and malignancy

Mohamed Abdullah Jaber \*

College of Dentistry, Surgical Sciences Department, Ajman University of Science and Technology, P.O. Box 346, United Arab Emirates

Received 1 August 2009; revised 8 February 2010; accepted 21 July 2010

Available online 12 October 2010

## KEYWORDS

Dental practitioners;  
Knowledge;  
Malignancy;  
Premalignancy

**Abstract Objectives:** The present study outlines the results of a pilot study to determine the knowledge and awareness of a cohort of dentists in United Arab Emirates (UAE) regarding aetiology, clinical features and appropriate early management of oral premalignant and malignant lesions.

**Materials and methods:** A self-administered questionnaire was constructed and posted to 300 UAE Dental Practitioners (DPs), selected randomly from the register of Emirates Dental Association. The present report details the responses of this cohort.

**Results:** 182 questionnaires were completed and returned (response rate 60.6%). One hundred and twenty-seven (69.8%) of the responding dentists were male and the median age of the DPs was 40 years (range 24–75 years). The majority (84%) practised or had practised in or around Dubai and Sharjah, 75% had graduated from a dental school after 1980. Eighty-two respondents (45.0%) had attended specific courses on premalignant or malignant oral lesions. During their undergraduate training 70% of DPs had witnessed more than 10 patients with oral SCC. Only 60.4% of respondents indicated that the tobacco and alcohol use were the principle causes of oral SCC while 19.7% suggested that HIV disease was a risk factor for oral SCC. 29% of DPs routinely recorded the tobacco or alcohol use of their patients and only 3.8% offered advice to patients regarding modification of these habits. Eighty-three percent of the respondents suggested that clinical screening was an effective means of reducing the frequency of premalignant and malignant oral lesions.

\* Tel.: 00971505178052; fax: 0097167056462.

E-mail address: mjaber4@hotmail.com



**Conclusions:** In view of the gradual rise in oral malignancy worldwide there is an increased need for DPs to be able to recognize the signs and symptoms of oral malignancy and premalignancy, provide appropriate preventive advice and be aware of the appropriate early management of patients with such oral lesions.

© 2010 King Saud University. Production and hosting by Elsevier B.V. All rights reserved.

## 1. Introduction

Epidemiological studies have shown that cancer of the mucosa of the oral cavity and pharynx are becoming more common worldwide (Macfarlane et al., 1994). The incidence of oral squamous cell carcinoma (SCC) is rising in most countries, particularly in cohorts born after around 1915 (Moore et al., 2000; Macfarlane et al., 1996; Bhurgri et al., 2006). The precise reasons for these epidemiological changes remain unknown but may reflect alterations in tobacco and alcohol habits, and aspects of social deprivation (Moore et al., 2000; Macfarlane et al., 1996).

Early diagnosis of oral and oropharyngeal malignancy is important to ensure maximal prognosis (Silverman, 2001). Furthermore, some patients with oral malignancies might have had preceding oral premalignant disorders with histopathologic evidence of oral epithelial dysplasia (OED) (Noonan and Kabani, 2005), thus early diagnosis of such lesions might result in reducing the frequency of oral malignancies and improve the patient's survival rate (Silverman et al., 1984; Lumerman et al., 1995).

Effective management of oral premalignancy and malignancy requires accurate diagnosis of lesions by Dental Practitioners (DPs), and appropriate communication and referral between primary and secondary health care workers, although it is known that there can be a significant delay in the referral of patients with oral SCC to appropriate specialists (McLeod et al., 1998). Furthermore DPs could potentially be important in any planned preventive or screening programmes of premalignant and malignant oral diseases.

Many studies have suggested that physicians and dentists do not adequately detect oral lesions in the early stages because of the practitioners' attitudes and knowledge (Schnetler, 1992; Shafer, 1975; Sadowsky et al., 1988; Guggenheimer et al., 1989).

There have been several attempted reports to improve oral SCC detection by dentists and dental hygienists (Hall et al., 1980; Amzel et al., 1982; Prout et al., 1992). A variety of approaches have been used to change dentist's behaviour and practice in the detection and management of malignant lesions. There is however, little information on the knowledge and attitudes of DPs regarding their appropriate management of patients with malignant lesions, likewise there is little data on the knowledge of primary health care workers concerning related aspects of the aetiology and clinical presentation of potentially malignant disorders. In view of this paucity of information the aim of this study was to assess the knowledge, opinions and clinical practice of DPs in UAE regarding relevant aspects of pre malignant and malignant oral lesions.

## 2. Materials and methods

A self-administered questionnaire (SAQ) was constructed and posted to 300 UAE DPs, selected randomly from the UAE

(Emirates Medical Association, Dental section) register. The questionnaire included demographic variables of the responding practitioners, such as age, gender, professional qualifications, year and centre of qualification, and postgraduate qualifications. Knowledge variables included the DP's knowledge of the clinical features of premalignant and malignant oral lesions, and their relevant undergraduate and postgraduate experience of managing patients with such disease. DPs were questioned on their opinions of the need for, and usefulness of, screening programmes, their methods of referral of patients to specialist's clinics and the methods they employed to motivate patients to reduce their risks of oral malignancy. Completed questionnaires were coded and entered into a data base prior to the analysis. Frequencies were used to examine the distribution of responses for all the variables and describe sample demographics. Much of the material collected was descriptive in nature. The statistical analysis included the use of descriptive statistics to examine the distribution of the responses for all the variables and to describe the sample demographics and cross-tabulation to examine the association between the variables. Categorical variables were analyzed

**Table 1** Demographic information of participants.

Factors	No.	%
<i>Gender</i>		
Male	127	69.8
Female	55	30.2
<i>Age</i>		
< 30 years	69	38.0
> 30 years	113	62.0
<i>Years of practice</i>		
< 16 years	78	42.9
> 16 years	104	57.1
<i>Type of practice</i>		
Public	39	21.4
Private	143	78.6
<i>Dental qualifications</i>		
BDS	109	59.9
DDS	73	40.1
<i>Postgraduate qualifications<sup>a</sup></i>		
M.Sc	24	42.8
Diploma	17	30.3
FDS	10	17.8
FDS/M.Sc	5	8.9
<i>Attendance at postgraduate meetings</i>		
Ministry of health organised	100	55.0
Special courses in oral malignancy and premalignancy	82	45.0

BDS, Bachelor of Dental Surgery; DDS, Doctor of Dental Surgery; M.Sc, Master of Science; FDS, Fellow Dental Surgery.

<sup>a</sup> Percentage out of 56 responding DPs.

**Table 2** Differences in the undergraduate clinical experience of dentists in premalignant and malignant lesions according to gender.

	Male	Female	No.	%
<i>Malignancy<sup>a</sup></i>				
Squamous cell carcinoma	56	16	72	56.2
Ameloblastoma	10	6	16	12.5
Lymphoma	5	2	7	5.4
Kaposi's sarcoma	3	4	7	5.4
Melanoma	7	4	11	8.5
Salivary gland tumours	7	3	10	7.8
Haemangioma	3	2	5	3.9
<i>Potentially malignant lesions<sup>b</sup></i>				
Leukoplakia	65	15	80	50.3
Erythroplakia	13	7	20	12.5
Lichen planus	29	7	36	22.6
Atrophic glossitis	3	3	6	3.7
Submucous fibrosis	4	2	6	3.7
Sideropenic anaemia	4	3	7	4.4
Others	2	2	4	2.5

<sup>a</sup> Percent out of 128 respondents.

<sup>b</sup> Percent out of 159 respondents.

**Table 3** Premalignant lesions witnessed each year by responding dentists according to type of practice.

Type of lesions witnessed (per year)	Private	Public	No.	%
<i>White lesions</i>				
1–10	42	66	108	84.3
11–21	5	7	12	9.3
>21	6	2	8	6.2
Total	53	75	128	100
<i>Speckled lesions</i>				
1–10	51	32	83	96.5
11–21	0	1	1	1.1
>21	1	1	2	2.3
Total	52	34	86	100
<i>Red lesions</i>				
1–10	39	49	88	87.1
11–21	7	3	10	9.9
>21	2	1	3	2.9
Total	48	53	101	100

using chi-squared test. A  $p$ -value  $\leq 0.05$  was considered significant. Data was analysed using SPSS software version 12.

### 3. Results

One hundred and eighty-two questionnaires were completed and returned (response rate 60.6%). One hundred and twenty-seven (69.8%) of the responding dentists were male and the median age of the DPs was 40 years (range 24–75 years). The majority (84%) practised or had practised in or around Dubai and Sharjah, 75% had graduated from a dental school after 1980. Sixty percentage of the respondents had a Bachelor of Dental Surgery (BDS) (Table 1). Only 56 (30%) of the respondents had additional postgraduate qualifications (Table 2), in the form of a diploma or master degree. Almost all the respondents attended postgraduate meetings, usually

**Table 4** Differences in the actual knowledge of characteristics of oral squamous cell carcinoma as detailed by the participants according to years of practice.

Characteristics	< 16 years	> 16 years	No.	%
<i>Likely sites</i>				
Floor of mouth	25	40	65	35.8
Tongue	18	25	43	23.7
Cheek	9	16	25	13.7
Lateral border of tongue	10	13	23	12.6
Ventral border of tongue	7	8	15	8.2
Upper lip	12	15	27	14.8
Lower lip	8	9	17	9.3
Hard palate	6	11	17	9.3
Soft palate	2	4	6	3.2
Retro-molar area	3	3	6	3.2
Oropharynx	2	2	4	2.1
Dorsum of the tongue	1	2	3	1.3
Cervical Lymph node	0	1	1	0.5
Commissure	0	0	0	0
<i>Likely size</i>				
5–10 mm	31	53	84	46.1
10–20 mm	21	31	52	28.5
20–30 mm	19	27	46	25.2
<i>Likely colour</i>				
White	22	29	51	28.0
Red	16	19	35	19.2
Speckled	18	14	32	17.5
White and red	38	26	64	35.1
<i>Additional features</i>				
Paraesthesia	33	45	78	42.8
Tooth mobility	19	25	44	24.1
Pathological fracture	13	16	29	15.9
Pain	12	16	28	15.3
Anaesthesia	1	2	3	1.6

Ministry of Health-funded meetings. Eighty-two respondents (45.0%) had attended specific courses on premalignant or malignant oral lesions. Respondents otherwise seemed to obtain professional information from the available dental journals. During their undergraduate dental studies 70.3% of the dentists witnessed patients with oral malignancies. Squamous cell carcinoma, the most frequently observed oral tumour (56.2%), with no statistically significant differences was found among this group of DPs in relation to gender (Table 2). Up to 84% of the DPs had witnessed less than 10 patients with potentially malignant lesions during their undergraduate studies; Leukoplakias being the most commonly observed (50.3%) potentially malignant oral lesions. Up to 84% of the practitioners reported that they saw up to 10 patients per year with oral mucosal white lesions. Perhaps surprisingly up to 87.1% suggested that they had examined patients with red or speckled oral mucosal lesions (Table 3).

Thirty-six percent of the respondents reported that the floor of the mouth was the most common site of an oral SCC, while 23.7% realised that overall the tongue was the most likely site. There were a wide range of other proposed common sites of such tumours. Few respondents realised that oral SCC could be white or small (e.g. less than 10 mm in diameter), although they were aware that oral tumours can rarely give rise to a number of other signs or symptoms (Table 4).

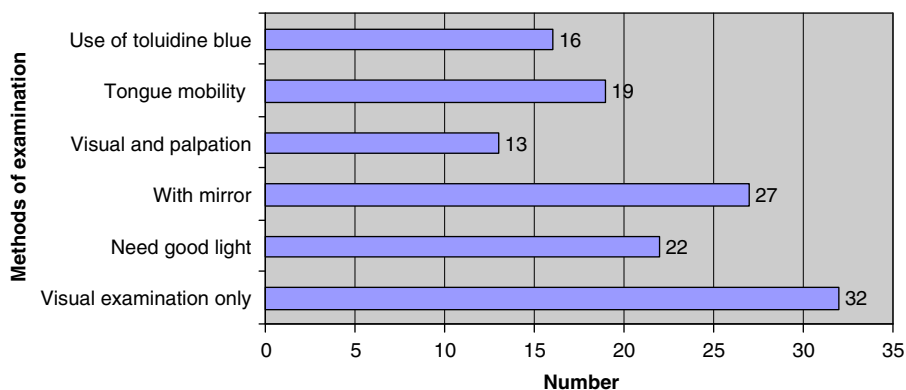


Figure 1 Chosen method of examination of malignant and premalignant oral lesions.

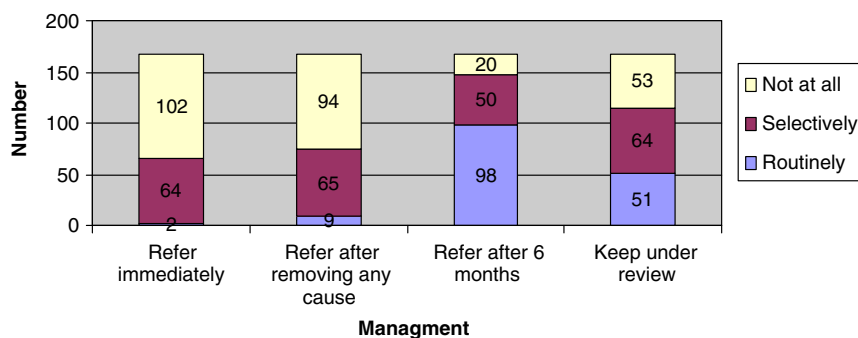


Figure 2 Management of patients with premalignant oral lesions.

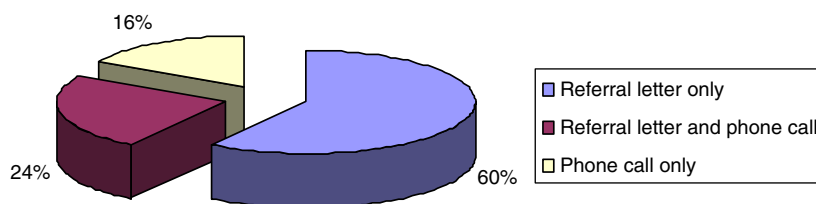


Figure 3 Likely method of referral of patients with premalignant or malignant lesions.

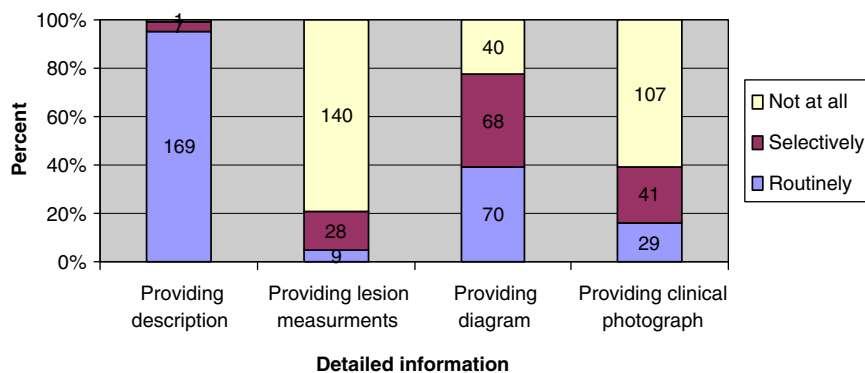


Figure 4 Details likely to be included in a referral letter.

Most respondents indicated that they would attempt to diagnose a premalignant or malignant oral lesion by visual examination alone. Twelve percent suggested the use of toluidine blue as an adjunct to diagnosis (Fig. 1). Less than 30% of respondents had ever undertaken a biopsy of a potentially

malignant oral lesion, and only 9.4% indicated that they would routinely undertake biopsies of the oral mucosa. Thirty percent of the practitioners indicated that they would selectively refer a patient with a potentially malignant lesion to an appropriate specialist, 5.3% also suggested that they would

**Table 5** Differences in the reported aetiological features of oral SCC by the participants according to the postgraduate qualifications.

Aetiological features	Have additional qualifications	No additional qualifications	No. <sup>a</sup>	%
Tobacco and alcohol	66	44	110	60.4
Previous oral cancer	50	25	75	41.2
HIV infection	7	29	36	19.7
Poor oral hygiene	22	8	30	16.4
Candidal infection	15	6	21	11.5
Syphilis	11	2	13	7.1
Tobacco alone	7	4	11	6.0
Malnutrition	2	6	8	4.3
Leukaemia	2	3	5	2.7
Viral infection	6	4	10	5.4

Chi-square = 44.0, idf = 11i, *p* = 0.000.

<sup>a</sup> 182 responding DPs.

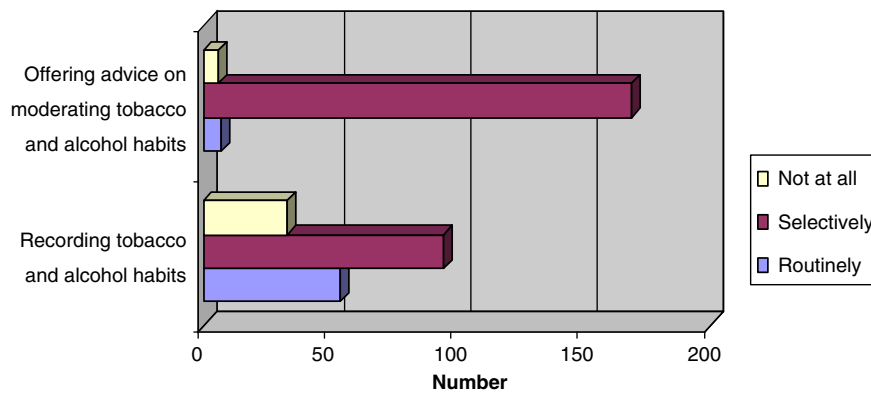
routinely consider the removal of likely local factors prior to referring the patient (Fig. 2). Sixty percent suggested that they would refer a patient to an appropriate specialist by letter, (Fig. 3) which routinely would include a detailed description of the lesion and or provide a diagram of the lesion. Few, however, would provide measurements of the lesion or an appropriate clinical photograph (Fig. 4). Only 60% of respondents indicated that tobacco and alcohol were the principal causative factors of oral squamous cell carcinoma. A spectrum of other

possible and unlikely causes of oral squamous cell carcinoma were suggested (Table 5); of note about 20% of the respondents suggested that HIV disease was a risk factor for oral SCC. DPs who have additional postgraduate qualifications were found to have better knowledge of aetiological factors causing SCC ( $X^2 = 44.0, p = <0.05$ ). Just 30% of responding dentists routinely recorded the tobacco or alcohol consumption of their patients and only 3.8% provided patients with any advice regarding modification of these habits (Figs. 5 and 6). Eighty-three percent of the respondents suggested that clinical screening was an effective means of reducing the frequency of premalignant and malignant oral lesions; and the majority suggested that this would require clinical examination of each patient every 3–6 months. Bi-variated analysis revealed that DPs who had been working for more than 16 years, working in public sectors, female, have additional qualifications, had attended special meeting about oral malignancies and premalignancies and were found to have better knowledge of relevant aspects of oral cancer screening than others and these differences were statistically significant (Table 6).

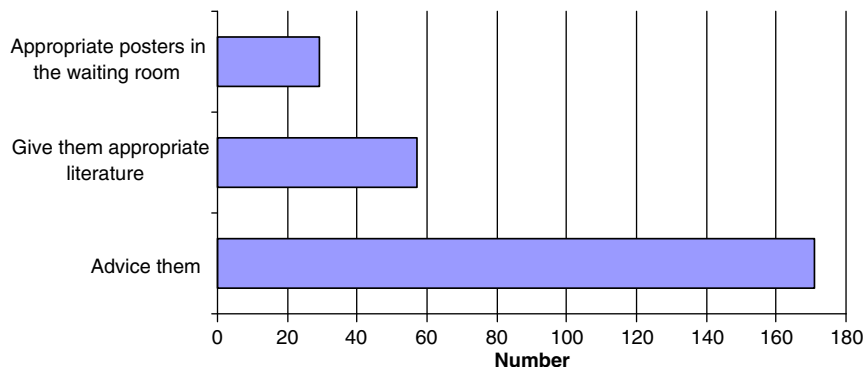
**4. Discussion**

The present study reflects the knowledge of UAE dental practitioners with regard to the diagnosis, prevention and initial management of oral premalignancy and malignancy in general dental practice.

An almost similar response rate has been reported form studies on the same topic conducted among dentists in the



**Figure 5** Recording of tobacco and alcohol consumption and providing of relevant advice.



**Figure 6** Methods used to motivate patients to change their tobacco and alcohol habits.

**Table 6** Bi-variate analysis of the relationship between gender, age, years of practice, type of practice, additional qualifications and suggested efficacy and recommended duration of oral screening programmes.

Screening	Screening effectiveness				Duration of screening (months)							
	Effective	Ineffective	Total (%)	<i>p</i> value	3	6	12	24	36	> 36	Total (%)	<i>p</i> value
<i>Gender</i>												
Male	98 (77.1)	29 (22.8)	127 (69.8)	0.00	40	71	11	2	0	1	127 (69.8)	0.000
Female	53 (96.3)	2 (3.7)	55 (30.2)	2	33	11	7	4	1	1	55 (30.2)	
<i>Age</i>												
< 30 years	57 (81.4)	13 (18.6)	70(38.4)	0.26	30	25	11	1	1	1	69 (38.0)	0.09
> 30 years	98 (87.5)	14 (12.5)	112 (61.6)		43	57	7	5	0	1	113 (62.0)	
<i>Years of practice</i>												
< 16 years	41 (52.5)	37 (47.5)	78(42.8)	0.00	34	28	10	4	1	1	78 (42.9)	0.22
> 16 years	93 (89.4)	11 (10.6)	104(57.1)	0	39	54	8	2	0	1	104 (57.1)	
<i>Type of practice</i>												
Public	31 (79.5)	8 (20.5)	39 (21.4)	0.00	13	9	11	3	1	2	39 (21.4)	0.000
Private	63	80	143 (78.6)	0	60	73	7	3	0	0	143 (78.6)	
<i>Additional qualifications</i>												
Yes	41 (73.2)	15 (26.8)	56 (30.8)	0.00	20	17	12	5	1	1	56 (30.8)	0.000
No	47 (37.3)	79 (62.7)	126 (69.2)	0	53	65	6	1	0	1	126 (69.2)	
<i>Attendance at special postgraduate meetings</i>												
Yes	77 (94.0)	5 (6.0)	82 (45.0)	0.00	41	20	15	4	1	1	82 (45.0)	0.000
No	34 (34.0)	66 (66.0)	100 (55.0)	0	32	62	3	2	0	1	100 (55.0)	

UK and USA (Macpherson et al., 2003; Yellowitz and Goodman, 1995) but higher than the 40% results reported by Alonge and Narendran (2003) from dentists practicing in Mexico. The low response rate may have introduced non-response bias into the results as it is generally assumed that respondents compared to non-respondents are those who are likely to be interested in the topic under study. Thus it is difficult to generalize the findings to all dentists working in the UAE. Nevertheless despite these limitations the study provides some important information about dentists' knowledge and opinions regarding oral premalignancies and malignancies.

It is evident that the present group of DPs did receive some undergraduate training in the diagnosis of oral malignancy and most had examined patients with SCC or leukoplakia. Likewise in general practice, they mostly had patients with white or red patches some of which could have been potentially malignant.

Dental practitioners were often aware of the likely sites of oral SCC and the majority reported 5–10 mm to be the critical lesion size that clinically distinguishes an early oral cancer from an advanced one. Although no specific lesion size has been identified as critical to the diagnosis of an early carcinoma, a diagnosis made before a lesion is 8 mm in size might have a more positive prognosis than if diagnosed at a later, more advanced stage (Yellowitz and Goodman, 1995). Although pain is associated with advanced lesions, many DPs did not identify it as an important symptom associated with the diagnosis of oral cancer.

The assessment of premalignant lesions principally on histological evaluation of a suitable biopsy, but less than 30% of the respondents had ever undertaken a biopsy of a premalignant oral lesion, and 10% indicated that they would routinely undertake biopsies of the oral mucosa. Though many premalignant lesions probably do not become malignant within the life time of the patient (Speight and Morgan, 1993), most cases are referred promptly to an appropriate specialist. However, half of the respondents also suggested that they would

consider the removal of likely local factors prior to referring the patient, and most would simply refer a patient by letter to an appropriate specialist centre.

The DPs rating for the risk factors of oral premalignant and malignant lesions showed that tobacco and alcohol habits as well as a patient's past history of head and neck cancer were rated in descending order as the most important risk factors. This suggests their knowledge is consistent with the current understanding of the aetiology of oral premalignant and malignant lesions (La Vecchia et al., 1997; Llewellyn et al., 2001; Schlecht et al., 2001; Jaber et al., 1998, 1999).

While 60% had some knowledge of the major likely causative factors of oral SCC, only 30% of the dentists enquired into the patient's social history in terms of the nature and amount of the risk factors (alcohol and tobacco) to which their patients were exposed and despite the evidence that with the removal of risk factors potentially malignant lesions may regress (Speight and Morgan, 1993; Lovas, 1989) and in contrast to their faith in screening, only a minority either demonstrated active involvement in, or favoured investment in, health promotion. This is somewhat disappointing given the well known evidence linking the alcohol consumption and tobacco smoking to the development of oral epithelial dysplasia and malignant oropharyngeal lesions (West and Krafona, 1990; Gupta et al., 1990; Jaber et al., 1998, 1999). Whatever the action of alcohol and smoking on the oral mucosa may be (Morse et al., 1996; Bruerd, 1990; Sankaranarayan, 1990; Kaugars et al., 1991; Creath et al., 1991; Schlecht et al., 2001), their use should be actively discouraged. Moreover, recommendations to reduce alcohol intake have the potential to reduce incidence of oral cancer and oral precancer in non-smokers and smokers alike. Contrary to earlier impressions, patients do readily accept alcohol screening and alcohol counseling by the dentist (Miller et al., 2006). Previous reports have shown evidence of improvement on tobacco cessation activities by the UK dentists in primary care setting (Johnson et al., 2006). However, 18% of



the DPs confirmed that the patient's social history formed no part of their patients' record. This is similar to the findings of a number of previous studies from UK which consistently has shown that few DPs routinely inquire about the smoking and drinking habits of their patients and even when they inquire they rarely included such information in patient's record (John et al., 1997; Warnakulasuriya and Johnson, 1999).

This study highlighted a gap in the knowledge of DPs similar to those reported previously involving the training of medical and dental students (Carter and Ogden, 2007a,b). In addition the results in this study reflect those obtained in a previous study involving dental practitioners that identified the need for improved education (Carter and Ogden, 2007a,b). All of these studies highlighted a need to emphasize the role of alcohol as well as tobacco as a risk factor; and to emphasize the importance of early oral mucosal changes in particular ulcerative lesions and red and white patches. Furthermore, targeted education is needed to prepare oral health providers to undertake oral cancer prevention activities as reported by Patton et al. (2006).

Over 24% of all respondents used a visual examination for the diagnosis of oral premalignant and malignant lesions because this technique is inexpensive, simple, acceptable and has high sensitivity and specificity (Speight et al., 1993; Jullien et al., 1995). This is in contrast to the report by Kujan et al. (2006) who reported that 89.9% of DPs strongly believed that visual screening is effective in the early detection and prevention of oral cancer.

Despite the reports by numerous investigators (Johnson et al., 1998; British Dental Association, 2000) encouraging dental health providers to use toluidine blue as an adjunct method for screening, few respondents (12.4%) used toluidine blue. This low percentage may reflect issues such as reliability, cost and a lack of robust evidence for its effectiveness or is perhaps a direct response by DPs to the reported high number of false positive results from toluidine blue application (Martin et al., 1998). Likewise Kujan et al. (2006) reported that almost 50% of the dental specialists and 17.5% of DPs did not believe that toluidine blue is effective for the early detection of oral cancer.

Almost all of the respondents suggested that they would include in their referral letter a detailed description of the lesions and or provide measurements of the lesions. However, a simple description appeared to be the preferred method of written documentation of these lesions. 37.8% provided a diagram selectively while 39.5% used diagrams routinely. Clinical photographic records would seem the most appropriate method as this approach does not rely on the same operator seeing the patient again to judge whether there are any changes. However, only 16.3% of the DPs used routine clinical photographs and 60.4% never photographed the lesions. The time taken for a tumour to develop from a single cell to one which is clinically detectable is one area which it is difficult to quantify, however, the time taken from its detection to its treatment is quantifiable and reasonable attempts should be made to minimize it.

Opportunistic screening by DPs includes a systematic examination of the oral mucosa during regular dental care. In the present study, the vast majority of the dentists (83%) were convinced of the efficacy of screening programmes for oral SCC, anticipating that an optimal resourced programme might reduce oral cancer mortality and the majority suggested this would require clinical examination of each patient every 3–6 months; this percentage is close to the one reported by other

authors in Europe and USA (Yellowitz and Goodman, 1995; McLeod et al., 1998; Kujan et al., 2006). In fact, though much of the potentially malignant lesions which they currently see must follow a comparatively indolent course, most dentists would elect for a screening interval of 6 months or less. It would seem that if a regular programme were ever introduced, the arbiter of success or failure would not be professional commitment. Studies support many factors other than knowledge and skills that influence providers' screening practices (Prout et al., 1992; Green et al., 1980; Battista et al., 1988; Glynn et al., 1990; Pommerenke and Weed, 1991). Given that this is potentially the most serious condition that a DP can prevent/diagnose, consideration should be given to it becoming a mandatory subject for continuing professional development/education.

Lack of awareness of oral cancer risk and clinical signs may also prohibit DP from delivering preventive advice. Our results demonstrated that only 45% of dentists in this study received special training on oral malignancy and premalignancy with 55% attended Ministry of Health organized educational meetings. This provides further evidence for the need of more training for dentists as highlighted by other reporters (Ogden and Ker, 1998; Macpherson et al., 2003). Wardh et al. (2009) used a questionnaire to test oral healthcare practices. The two groups underwent a four hour teaching programme and repeated the questionnaire 2 years later. They conclude that specific knowledge was not retained after some time and they suggested continuous use of a new skill for reinforcement.

On the basis of high mortality rate due to oral cancer, early diagnoses and examinations of oral malignancies and premalignancies need to be incorporated into the routine clinical protocol of health care professionals.

## 5. Conclusion

In view of the gradual rise in oral malignancy worldwide there is an increased need for DPs to be able to recognize the signs and symptoms of oral malignancy and premalignancy, provide appropriate preventive advice and be aware of the appropriate early management of patients with such oral lesions.

## References

- Amzel, Z., Strawitz, J.G., Engstrom, P.F. 1982. Oral cancer screening in the dental office, In: Mettlin, C., Murphy, G.P. (Eds.), *Issues in Cancer Screening and Communications*. New York, Alan R. Liss, Inc., pp. 163–174.
- Alonge, O.K., Narendran, S., 2003. Opinions about oral cancer prevention and early detection among dentists practicing along the Texas-Mexico border. *Oral Dis.* 9, 41–45.
- Battista, R.N., Lawrence, R.S., 1988. Implementing preventive services. *Am. J. Prev. Med.* 4, 1–94.
- Bhurghi, A., Usman, S., Pervez, N., 2006. Epidemiological review of head and neck cancer in Karachi. *Asian Pac. Cancer Prev.* 7, 195–200.
- British Dental Association. 2000. *Opportunistic oral cancer screening: a management strategy for dental practice*. British Dental Association, London. BDA Scientific Publication No. 6.
- Bruerd, B., 1990. Smokeless tobacco use among Native American school children. *Public Health Rep.* 105, 196–201.
- Carter, L.M., Ogden, G.R., 2007a. Oral cancer awareness of undergraduate medical and dental students. *BMC Med. Educ.* 7, 44.
- Carter, L.M., Ogden, G.R., 2007b. Oral cancer awareness of general medical and general dental practitioners. *Br. Dent. J.* 203, 248–249.

- Creath, C., Cutter, G., Bradley, D., Wright, J., 1991. Oral leukoplakia and adolescent smokeless tobacco use. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endo.* 72, 35–41.
- Glynn, T.J., Manley, M.W., Cullen, J.W., Mayer, W.J., 1990. Cancer prevention through physician intervention. *Sem. Oncol.* 17, 391–401.
- Green, L., Kreuter, M., Deeds, S., Partridge, K., 1980. Health education planning: a diagnostic approach. Mayfield Publishing, Palo Alto, Calif..
- Guggenheimer, J., Verbin, R.S., Johnson, J.T., Horkowitz, C.A., Myers, E.N., 1989. Factors delaying the diagnosis of oral and oropharyngeal carcinomas. *Cancer* 64, 932–935.
- Gupta, P.C., Mehta, F.S., Pindborg, J.J., 1990. Primary prevention of oral cancer among Indian villagers. Eight-year follow-up results, vol. 103. IARC. Scientific Publications, 149–156.
- Hall, G., Melrose, R., Abrams, A.M., 1980. Education in early detection of oral squamous cell carcinoma: a community outreach program. *J. Am. Dent. Assoc.* 100, 362–365.
- Jaber, M.A., Porter, S.R., Scully, C., Gilthorpe, M., Bedi, R., 1999. Risk factors for oral epithelial dysplasia – the role of smoking and alcohol. *Oral Oncol. Eur. J. Cancer* 35, 151–156.
- Jaber, M.A., Porter, S.R., Scully, C., Bedi, R., Gilthorpe, M., 1998. The role of alcohol in non-smokers and tobacco in non-drinkers in the aetiology of oral epithelial dysplasia. *Int. J. Cancer* 77, 333–336.
- John, J.H., Yudkin, P., Murphy, M., Ziebland, S., Fowler, G.H., 1997. Smoking cessation interventions for dental practices—attitudes and reported practices of dentists in Oxford region. *Br. Dent. J.* 183, 359–364.
- Johnson, N., Warnakulasuriya, S., Speight, P., Epstein, J., 1998. Diagnosis oral cancer: can toluidine blue mouthwash help? *FDI World* 7, 22–26.
- Johnson, N.W., Lowe, J.C., Warnakulasuriya, K.A., 2006. Tobacco cessation activities of UK dentists in primary care: signs of improvement. *Br. Dent. J.* 200, 85–89.
- Jullien, J.A., Downer, M.C., Zakrzewska, J.M., Speight, P.M., 1995. Evaluation of a screening test for the early detection of oral cancer and precancer. *Community Dent. Health* 12, 3–7.
- Kaugars, G., Brandt, R., Chan, W., Carcise-Edinboro, P., 1991. Evaluation of risks factors in smokeless tobacco-associated oral lesions. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endo.* 72, 326–331.
- Kujan, O., Duxbury, A.J., Glenny, A.M., Thakker, N.S., Sloan, P., 2006. Opinion and attitudes of the UK's DP and specialists in oral surgery, oral medicine and surgical dentistry on oral cancer screening. *Oral Dis.* 12, 194–199.
- La Vecchia, C., Tavani, A., Franceschi, S., Levi, F., Corrao, G., Nergi, E., 1997. Epidemiology and prevention of oral cancer. *Oral Oncol.* 33, 302–312.
- Lovas, J., 1989. Oral pre-cancer: patterns, complexities and clinical guidelines. *J. Can. Dent. Assoc.* 55, 209–214.
- Llewellyn, C.D., Johnson, N.W., Warnakulasuriya, K.A.A.S., 2001. Risk factors for squamous cell carcinoma of the oral cavity in young people – a comprehensive literature review. *Oral Oncol.* 37, 401–418.
- Lumerman, H., Freedman, P., Kerpel, S., 1995. Oral epithelial dysplasia and the development of invasive squamous cell carcinoma. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endo.* 79, 321–329.
- McLeod, N.M., Saeed, N.R., Ali, E.A., 1998. Oral cancer: delays in referral and diagnosis persist. *Br. Dent. J.* 11, 681–684.
- Macfarlane, G., Boyle, P., Evstifeeva, T., Robertson, C., Scully, C., 1994. Raising mortality from oral cancer among males world-wide. The return of an old public health problem. *Cancer Causes Control* 5, 259–265.
- Macfarlane, G., Sharp, L., Porter, S., Franceschi, S., 1996. Trends in survival from cancers of the oral cavity and pharynx in Scotland: a clue as to why the disease becoming more common? *Br. J. Cancer* 73, 805–808.
- Macpherson, L.M.D., McCann, M.F., Gibson, J., Binnie, V.I., Stephen, K.W., 2003. The role of primary healthcare professionals in oral cancer prevention and detection. *Br. Dent. J.* 195, 277–281.
- Martin, I.C., Kerawala, C.J., Reed, M., 1998. The application of toluidine blue as a diagnostic adjunct in the detection of epithelial dysplasia. *Oral Surg. Oral Med. Oral Pathol.* 85, 444–446.
- Moore, S., Johnson, N., Pierce, A., 2000. The epidemiology of mouth cancer: a review of global incidence. *Oral Dis.* 6, 65–74.
- Miller, P.M., Ravenel, M.C., Shealy, A.E., Thomas, S., 2006. Alcohol screening in dental patients: the prevalence of hazardous drinking and patients' attitudes about screening and advice. *J. Am. Dent. Assoc.* 132, 1692–1698.
- Morse, D.E., Katz, R.V., Pendrys, D.G., 1996. Smoking and drinking in relation to oral epithelial dysplasia. *Cancer Epidemiol. Biomarkers Prev.* 5, 769–777.
- Noonan, V.L., Kabani, S., 2005. Diagnosis and management of suspicious lesions of the oral cavity. *Otolaryngol. Clin. North Am.* 38, 21–35.
- Ogden, G.R., Ker, J., 1998. General medical practitioner's knowledge of the specialty of oral and maxillofacial surgery. *Br. J. Oral Maxillofac. Surg.* 36, 479–480.
- Patton, L.L., Elter, J.R., Southerland, J.H., Strauss, R.P., 2006. Adequacy of training in oral cancer prevention and screening as self assessed by physicians, nurse practitioners, and dental health professionals. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endo.* 102, 758–764.
- Pommerenke, F.A., Weed, D.L., 1991. Physician compliance: improving skills in preventive medicine practices. *Am. Fam. Phys.* 43, 560–568.
- Prout, M.N., Morris, S.J., Witzburg, R.A., Hurlby, C., Charrerjee, S., 1992. A multidisciplinary educational program to promote head and neck cancer screening. *J. Cancer Educ.* 7, 139–146.
- Sankaranarayan, A.R., 1990. Oral cancer in India: an epidemiologic and clinical review. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endo.* 69, 325–330.
- Sadowsky, D., Kunzel, C., Phelan, J., 1988. Dentists' knowledge, case-finding behavior, and confirmed diagnosis of oral cancer. *J. Cancer Educ.* 3, 127–134.
- Schnetler, J.F.C., 1992. Oral cancer diagnosis and delays in referral. *Br. J. Maxillofac Surg.* 30, 210–213.
- Schlecht, N.F., Pintos, J., Kowalski, L.P., Franco, E.L., 2001. Effect of type of alcoholic beverage on the risk of upper aerodigestive tract cancers in Brazil. *Cancer Causes Control* 12, 579–587.
- Shafer, W.G., 1975. Initial mismanagement and delay in diagnosis of oral cancer. *J. Am. Dent. Assoc.* 90, 1262–1264.
- Silverman Jr., S., 2001. Demographics and occurrence of oral and pharyngeal cancers: the outcomes, the trends, the challenge. *J. Am. Dent. Assoc.* 32 (supplement), 7S–11S.
- Silverman, S., Gorsky, M., Lozuda, F., 1984. Oral leukoplakia and malignant transformation: a follow-up study of 257 patients. *Cancer (Phila.)* 53, 563–568.
- Speight, P.M., Morgan, P.R., 1993. The natural history and pathology of oral cancer and precancer. *Community Dent. Health* 10, 31–41.
- Speight, P.M., Zakrzewska, J., Downer, M.C., 1993. Conclusions and recommendations. *Community Dent. Health* 10 (Suppl. 1), 87–89.
- Wardh, I., Paulsson, G., Fridlund, B., 2009. Nursing staff's understanding of oral health care for patients with cancer diagnoses: an intervention study. *J. Clin. Nurs.* 18 (6), 799–806.
- Warnakulasuriya, K., Johnson, N.W., 1999. Dentists and oral cancer prevention in the UK: opinion, attitudes and practices to screening for mucosal lesions and to counseling on tobacco and alcohol use: baseline data from 1991. *Oral Dis.* 5, 10–14.
- West, R., Krafona, K., 1990. Oral tobacco: prevalence, health risks, dependence potential and public policy. *Br. J. Addic.* 85, 1097–1098.
- Yellowitz, J.A., Goodman, H.S., 1995. Assessing physicians' and dentist's oral cancer knowledge and opinions and practices. *J. Am. Dent. Assoc.* 126, 53–60.