Oral cancer knowledge, attitudes and practices among dentists in Khartoum State, Sudan

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Supervisor

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Abstract

The incidence of oral cancer is rising in the Sudan. Detecting oral cancer at an early stage is the most effective means of improving survival and reducing morbidity from disease.

Aim: The aim of the present study was to determine the knowledge, attitude and practice of dentists related to oral cancer prevention and early detection in public dental clinics in Khartoum State, Sudan.

Materials and Methods: A cross-sectional survey using an administered structured questionnaire was carried out. The questionnaire consisted of 28 questions that included the key areas of oral cancer prevention and early detection. A sample of 130 dental practitioners was requested to participate in the study.

Results: The response rate was 86.92%. The majority were female (68.1%) between the ages of 20 -40 years old. The majority were aware of the major risk factors and the most common presentations of oral cancer. About two thirds (63.7%) perceived that their knowledge on oral cancer was current. However, almost a third (35.4.6%) reported that they had sufficient knowledge concerning oral cancer prevention. More than half (54 percent) reported that they do not carry out any special examination to detect oral cancer in asymptomatic patients. Two thirds (66.3%) believed that their undergraduate training in the diagnosis of oral cancer was inadequate. The vast majority (95.6%) were interested in further oral cancer continuing education and 88.5% that development of referral guidelines can improve the quality of referrals to specialists.

Conclusions: The findings of the present study indicate that there is a need for further training in the early detection and prevention of oral cancer, as well as an increased emphasis on oral cancer diagnosis and prevention in the dental training curriculum.

Declaration

I, the undersigned, hereby declare that the work contained in this dissertation is my original work and that it has not been previously in its entirety or in part submitted at any university for a degree.

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Dr. Nada Hassan Mohamed Ahmed

Dedication

Dedicated to

My beloved parents, brothers and sisters for their continuous love and believing in me. Without whom I could not have made it here.

My husband Hani for his unfailing encouragement and support - you have been a source of inspiration to me. Your love, care and constant patience have taught me a lot.

My sons Ahmed and Mohamed thank you for all the joys you brought to my in life. You are truly a blessing and the greatest gift God could have given me.

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Chapter 1: Introduction

The Republic of Sudan is a country in northeastern Africa, with a total area of 1, 881,000 million square kilometers million sq.km; it regards the third largest country in the region before the July 2011 secession of South Sudan. Sudan shares borders with seven African countries: Egypt and Libya at the north, Chad and the Central Africa at the west, South Sudan in the south, and Ethiopia and Eritrea in the east. It also neighbors Saudi Arabia across the Red Sea at the east. Sudan belongs to the EMRO region of the World Health Organization. The total population is 33,419,625 according to the 2008 census (CBS, 2008). The official language is Arabic and Khartoum is the capital city.

Figure 1: Republic of Sudan

Khartoum state is the capital of the country; it covers an area of 20,000 sq mile comprised of three main cities (Khartoum, Khartoum Bahri and Omdurman) and administratively divided into 7 localities. The total population is 5,706,507 making it the most populous state that comprises 17.1% of total population (CBS, 2008).

Health care services in Khartoum State are provided by different providers in both public and private sectors. The Ministry of Health, Khartoum State is the main public service provider. The others are Federal Ministry of Health, universities, armed forces, the private sector, and governmental and non-governmental organizations. The dentist-to-population ratio according to a 2009 report is approximately 1:17,034 (OHD, 2012). There are 63 State dental clinics located in different hospitals and healthcare centers in Khartoum State providing oral healthcare services for about 150,000 people per annum.

Cancers of the oral cavity are malignancies arising in the lip, tongue, floor of the mouth, gingiva, palate, buccal mucosa/vestibule and salivary glands. Pharyngeal cancers describe those developing in the tonsillar fossa, oropharynx, nasopharynx and hypopharynx. Nearly 90 percent of oral cancers are carcinomas, which occur in the stratified squamous epithelium lining these anatomical areas (Silverman, 1998).

Oral Cancer (OC) is an important public health problem in terms of its incidence and mortality, both of which will increase as populations continue to grow and age, and as risk factors for cancer associated with greater affluence, such as smoking and changes in diet, continue to increase. The impact of oral cancer on individuals and communities as a result of the pain and suffering, impairment of function and reduced quality of, cost of treatment, is considerable. In Sudan, oral cancer is one of the major public health problems, is the fifth most common cancer with an incidence rate of 920/year), and comprising 9% of all the cases reported in Africa (IARC, 2010).

Problem Statement

Given that oral cancer occurs in a location (the oral cavity) that is easily accessible to visual examination and detection, and that survival is stage-dependent (Taybos, 1997); it is difficult to comprehend why most oral cancers are still diagnosed when they are at an advanced stage (Shiboski *et al*, 2000). This may be due to the fact that the early diagnosis of OC is inadequate, and this may be a reflection of the poor access to care. Despite comprehensive body of knowledge that has been generated during the second half of the last century, the burden of oral cancer is large and the 5-year survival rate remains unchanged.

Justification

Dentists have a critical role to play in the early diagnosis of oral cancer (Canto *et al*, 2002), and it is generally recognized as a part of their professional responsibilities. The recognition and the early detection of oral cancer not only guarantee an increase in the survival rate and less aggressive, mutilating and costly treatments, but also an improvement in oral health quality of life (Downer *et al*, 2006).

Understanding opinions, attitudes and practices of dental healthcare professionals is vital in order to assess their effectiveness in the prevention and early detection of oral cancer, thus helping to reduce its mortality and morbidity (Horowitz *et al*, 1996). The present study is an attempt to determine dentists' knowledge, attitudes and practices of oral cancer in Khartoum State, to provide baseline data prior to conducting interventions designed to increase dentists' capacity to early detect and manage of oral cancers and how they can provide counseling advice to their patients about risk reduction, thus reducing the mortality and morbidity of the disease.

Chapter 2: Literature Review

2.1 Epidemiology of oral cancer

Cancer is one of the major public health problems in the developed world and is increasing in the developing world (Petersen, 2003). The World Health Organization reported that oral cancer has one of the highest mortality ratios amongst all malignancies (Ferlay *et al,* 2000); it is ranked as the eighth most common cancer worldwide (Stewart *et al*, 2003; Petersen, 2005).

An estimated 263,900 new cases and 128,000 deaths from oral cavity cancer including lip cancer occurred in 2008 worldwide (Jemal *et al,* 2011). The incidence rate for oral cancer in males ranges from 1 – 10 cases per 100,000 populations in many countries (Petersen, 2008). Generally, the highest oral cavity cancer rates are found in Melanesia, South-Central Asia, and Central and Eastern Europe and the lowest in Africa, Central America, and Eastern Asia for both males and females.

In the United States of America an estimated 28,000 new cases of oral cancer were diagnosed in 2007 and 9,000 deaths occurred as a result of these malignancies (Jemal and Siegel, 2008). The National Cancer Institute of Canada estimated the number of deaths from oral cancers and pharyngeal cancers were 1,050 in 2000. In the European Union oral and pharyngeal cancer was the 7th most common cancer with 67,000 new cases registered in 2004 (Boyle and Ferlay, 2004).

In the United Kingdom, oral cancer is estimated to account for 1– 4% of all malignancies (Johnson and Warnakulasuriya, 1993) with an incidence of approximately 3,500 cases per year (Macpherson *et al,* 2000). However, France has the highest incidence rate with around 15,500 cancers of lip, oral cavity and pharynx reported annually (Warnakulasuriya, 2008). In South-Central Asia, cancer of the oral cavity ranks among the three most common types of cancer.

India is often cited as the country with the highest incidence in the world with over 100,000 cases is registered every year (Warnakulasuriya, 2008). The age standardized incidence rate of oral cancer is reported at 12.6 per 100,000 populations. In Australia, 2357 new cases of cancer in the oral cavity were diagnosed during 2005 (AIHW, 2008).

Data from Africa are limited to a few hospital cancer registers; therefore it is difficult to extrapolate the true incidence in these countries (Warnakulasuriya, 2008). In sub Saharan Africa, there is an increasing prevalence of Kaposi Sarcoma, an AIDS-defining lesion in those who are HIV positive. An estimated 22,000 cases in males and 12,000 cases in females were diagnosed in 2008. The majority of these cases occurred in the countries of Eastern Africa (which includes Ethiopia, Rwanda, Uganda, Zambia, and Zimbabwe) (Jemal *et al*, 2011).

In Sudan, oral cancer is one of the major public health problems; and is the fifth most common type of cancer with an incidence rate of 920/year, comprising 9% of the cases reported in Africa (IARC, 2010). Oral cancer has a very high mortality rate particularly among men due to snuff-using habit (locally known as Toombak). It is specifically the nitrose amine rich tobacco which has been implicated in the etiology of oral cancer (Idris, 1995).

It is noteworthy that more recently sharp increases in the incidence rates of oral/pharyngeal cancers have been noted for several countries and regions such as Denmark, France, Germany, Scotland, central and Eastern Europe, and to a lesser extent Australia, Japan and New Zealand (Petersen, 2003).

2.1.1 Epidemiological Studies

Over the last decade, numerous published epidemiological investigations conducted in several countries have examined the knowledge, attitude and practices of oral cancer among dentists. Understanding the knowledge, attitudes and practices of dental health care professionals is vital in order to determine their effectiveness in the prevention and early detection of oral cancer, thus helping to reduce its mortality and morbidity (Horowitz *et al*, 2000).

A variation in the knowledge of dental health care professionals and their opinions and practices regarding oral cancer prevention and early detection has been described in numerous surveys in the USA (Yellowitz *et al*, 2000); Maryland (Horowitz *et al*, 2000); Texas (Alonge and Narendran, 2003); Brazil (Leao *et al*, 2005); New York (Gajendra *et al*, 2006) ; the UK (Kujan *et al*, 2006) ; Canada (Clovis *et al*, 2002); Ireland (Decuseara *et al*, 2011); Spain (López-Jornet *et al*, 2011) and Italy (Colella and Gaeta, 2008). These studies reported that dentists were generally knowledgeable about oral cancer, but that there were gaps in their knowledge, and that in their practices did not provide sufficient preventive activities. However, the response rates for these different studies varied greatly: In 1999 Warnakulasuriya and Johnson in their study among dentists in UK analyzed 2532 questionnaires and obtained a weak response rate of (16%), Decuseara and his colleagues in Ireland an 18% response rate, while in Italy, Colella and his colleagues a response rate of 45.7% and in the UK, Kujan *et al* (2006) a better response rate of 66.9 %.

A study conducted in New York State among a random sample of practicing dentists and dental hygienists found them to be knowledgeable about oral cancer, but with gaps in the knowledge related to the risk factors and in oral cancer examination techniques (Gajendra *et al*, 2006). López-Jornet *et al.* (2011) conducted a postal survey among a random selection of general dentists in Spain and also found that gaps in knowledge that strongly suggested the need for continued education courses in the detection and prevention of oral cancer (López-Jornet *et al*, 2011).

Leao *et al.* (2005) found that knowledge of oral cancer among Brazilian dentists was sub-optimal, while a comparable study in Ireland suggested that Irish dentists were generally knowledgeable of oral cancer risk factors and diagnostic concepts, but this was associated with recent graduation and attendance of continuing education courses (Decuseara *et al*, 2011).

2.2 Risk factors of oral cancer

2.2 .1 Tobacco and Alcohol

According to World Health Organization 4.9 million people worldwide died in 2000 as a result of their addiction to nicotine. This huge death toll is rising rapidly, especially in low- and middle-income countries where account for half of all deaths attributable to tobacco. This proportion will rise to 7 out of 10 by 2025 because smoking prevalence has been increasing in many developing countries (WHO, 2002).

Tobacco and alcohol are regarded as the major risk factors for oral cancer (Shah, 2003) and they act synergistically to initiate cancer of the oro-pharynx (Hashibe *et al*, 2009). Worldwide, smoking accounts for 42% of deaths from cancers of the oral cavity (including the pharynx) and heavy alcohol consumption for 16% of the deaths; the corresponding percentages in high-income countries are about 70% and 30%, respectively (Danaei *et al,* 2005). A recent study estimated that around 70% of oral and pharyngeal cancers in men and around 55% in women in the UK in 2010 were caused by smoking tobacco (Parkin, 2011).

Tobacco can be used in several ways. Smoking tobacco can also be chewed alone or added to betel quid. The evidence that smokeless tobacco causes oral cancer was confirmed recently by the International Agency for Research on Cancer (IARC, 2004); and the risk is dependent on dose and duration of use of smokeless tobacco (Balaram *et al*, 2002).

In India and Sudan, more than 50% of oral cancers are attributable to smokeless tobacco products. A recent meta-analysis showed a more than doubling in risk of oral cancer with use of smokeless tobacco in the United States and Canada; a five-fold risk increase for India and other Asian countries and a seven-fold risk increase in Sudan. No risk increase for oral cancer was shown with smokeless tobacco use in the Nordic countries (Boffetta *et al,* 2008).

Alcohol intake increases the risk for oral cancer by a greater amount in smokers than non-smokers, with a six-fold risk increase for heavy drinking in smokers, compared with a three-fold risk increase in never/ex-smokers (Turati *et al,* 2012).

The population-attributable risks have been estimated to be 80% for males, 61% for females, and 74% overall (Castellsagué, 2003). In 2010, around 37% of oral and pharyngeal cancers in men and 17% in women in the UK were linked to alcohol (Parkin, 2010).

2.2 .2 Dietary factors

Global reviews of the role of dietary factors in the causation of cancer provided evidence to show that the diet plays an important role as a protective factor against the development of oral cancer (WHO, 2003). Dietary factors are thought to account for about 30% of cancers in Western countries and lower in developing countries (Schatzkin, 2004). Diets low in vitamin A; C and E have been associated with an increased risk of oral cancer (McLaughlin *et al*, 1988). In 2006 a meta-analysis identified strong evidence of the protective role of vegetables and fruits, particularly citrus fruits in the prevention of oral cancer. The study showed a significant risk reduction of about 50% for each additional daily serving of fruit or vegetables (*Pavia et al*, 2006). In the UK, 57% of oral and pharyngeal cancers in men and 54% in women in the UK were linked to people eating fewer than five portions a day (400g/day) of fruit and vegetables (Parkin and Boyd, 2011).

2.2 .3 Viral infections

Infectious agents have been implicated in some cancers of the oral cavity and pharynx, particularly in younger populations (Gillison, 2007). Recent epidemiological and experimental data have implicated infection with human papilloma virus in the pathogenesis of oral cancer; and suggest that about 35 % of all oral cancers are positive for HPV DNA (Kreimer *et al,* 2005), with 90 to 95 % positive for HPV-16 (D'Souza *et al,* 2007). An increased risk of oral cancer has been shown in individuals with HIV/AIDS (Grulich *et al,* 2007) such as Kaposi sarcoma and non-Hodgkin lymphoma.

2.2 .4 Exposure to the sun

Prolonged exposure to ultraviolet radiation from the sun without a broad spectrum sun protection factor can increase the risk of skin cancer. People who are outdoors for an extended period of time increase their risk of developing lip cancer, an often

overlooked site for non-melanoma skin cancers (Armstrong and Kricker, 1993). Lip cancers mostly occur on the vermilion border of the lower lip and share many of the epidemiological characteristics of non-melanocytic skin cancers (Schottenfeld, 1996).

2.2 .5 Socioeconomic status

Low socioeconomic status has been significantly associated with an increased oral cancer risk in high and lower income-countries (Conway, 2008). These groups often have less access to the health services and health education that would empower them to make decisions to protect and improve their own health. The mortality rate is relatively low for developed countries where health services are available to populations, however, relatively high for low- and middle-income countries with limited access to health facilities, about 70% of all cancer deaths occur in low- and middle-income countries (Petersen, 2008).

2.2 .6 Previous history of cancer

People who have had previous oral and pharyngeal cancer have a more than 30-fold increased risk of a recurrence of oral and pharyngeal cancer, and the risk remains 20-fold higher ten or more years after the first diagnosis (Levi *et al,* 2006).

2.2 .7 Genetic predisposition

The etiology of oral cancer has been clearly defined in terms of the environmental factors but until recently little attention has been paid to the possible role of genetic factors that predispose to this condition. An individual with a hereditary predisposition for oral cancer is a person with an increased likelihood of developing cancer due to inherited genes. These inherited genes make body cells more sensitive to environmental factors, such as sunlight and tobacco, and, therefore change normal body cells into cancer cells. A recent study has reported that there may be a genetic component to the risk of oral cancer among alcohol and tobacco user's people with a family history of cancer (Negri *et al,* 2009). Individuals who have homozygous deletion of the GSTM1 gene have increased risk for oral cancer. The risk increases further when these individuals are exposed to environmental toxicants such as chemicals in cigarette smoke, alcohol, and betel quid (Kietthubthew *et al,* 2001).

Increased risk of cancer is noted amongst relatives of patients with squamous cell carcinoma of head and neck (Copper *et al,* 1995).

2.2 .8 Sexual activity

Recently the association between oral cancer and sexual activity has been explored. Heck *et al*. (2010) found that women, who have ever had oral sex, had four times greater risk of cancer of the base of the tongue than women who had not, and having two sexual partners in comparison with only one doubled the risk. Among men a history of same-sex sexual contact increased the risk by almost nine-fold. (Heck et al, 2010).

The knowledge of oral cancer risk factors has been reported to be a predictor for having or being aware of the existence of an oral cancer examination (Cruz *et al*, 2002). A study done in Ireland found that the vast majority of Irish dentists identified alcohol and tobacco as the main risk factors for oral cancer (Decuseara *et al,* 2011), similar to other studies previously carried out in the USA (Yellowitz et al, 2000), Canada (Clovis *et al,* 2002) and Brazil (Leao *et al,* 2005).A smaller proportion of dentists were aware that HPV, low consumption of fruit and vegetables and sun exposure are also potential risk factors.

In Italy respondents for similar survey were also aware of the major risk factors associated with oral cancer, since the largest number of them identified tobacco (94.1%), alcohol usage (79.2%) and prior oral cancer lesions (89.5%) as risk factors. However, only 25% were aware of the protective effect of fruit and vegetable consumption (Colella and Gaeta , 2008).

Gajendra and colleagues found that a very high percentage of New York dentists and dental hygienists who were aware that tobacco (90%) and alcohol (> 80%) are risk factors for oral cancer, but only 25% of dentists and 30% of dental hygienists were aware that low consumption of fruits and vegetables is a risk factor, and less than 60% in both groups were aware of the relationship between sun exposure and lip cancer (Gajendra *et al*, 2006).

2.3 The most common sites and forms of oral cancer

Oral squamous cell carcinoma (OSCC) which arises from the oral mucosal lining represents more than 90% of the cancers that affect the oral cavity (Kujan *et al*, 2006; Silverman, 2001) followed by adenocarcinomas and Kaposi sarcomas. Oral cancers can occur on any oral mucosal site. Typically, they occur in a U-shaped zone from the tonsillar pillars and lateral soft palate, to the lateral tongue, and ending at the anterior floor of the mouth. At one time the lip was the most common site for oral cancer; however, the incidence of cancer in this location has decreased significantly over the past half century because fewer men have outdoor occupations (Neville and Damm, 2002). The tongue and floor of the mouth has been identified by Silverman (1998) as the most common anatomical sites for oral cancer.

The relative incidence rates of oral squamous cell carcinomas are as follows (Sapp and Eversole et al, 2004):

- Tongue - 25%.
- Lower Lip (vermilion) - 30-40%.
- Floor of mouth - 20%.
- Oropharynx/soft palate - 15%.

Tobacco and alcohol-related lesions are often located in different areas of the oral cavity compared to HPV-related lesions. They are usually found on the anterior tongue, floor of the mouth, buccal mucosa, and alveolar ridges; while HPV-related oral squamous cell carcinomas appear towards the posterior regions of the oral cavity (base of the tongue, oropharynx, tonsils, and tonsillar pillars) (The Oral Cancer Foundation, 2008).

In Spain, most dentists (90.6%) identified OSCC as the most frequent histological type of oral cancer (López-Jornet *et al,* 2011); while only 32% of Italian dentists were able to do so (Colella and Gaeta, 2008). Regarding oral cancer location, 89.1% of Spanish dentists and 59.5% of Italian dentists were aware that the tongue and floor of the mouth were the two most common sites of oral cancer. Similar findings have been reported among dentists practicing in the United States (Yellowitz *et al*, 2000).

The majority of the dentists in Bangalore, India identified OSCC as the most common form of oral cancer and the buccal mucosa was selected as a the most common site by 83% (Vijay Kumar and Suresan, 2012). In a survey of dentists and primary care physicians in Massachusetts, US only 9 percent of physicians and 39 percent of dentists were able to identify the two most common sites of oral cancer (Applebaum *et al*, 2009).

2.4 Demographic features of people with oral cancer

Oral cancer most commonly occurs in middle-aged and older individuals, 90 percent of malignancies occurring in people older than the age of 45 years. Recently, there has been an increase in the number of young adults who develop oral cancer especially cancer of the tongue, without any apparent risk factors such as tobacco use or immunosuppressant (Llewellyn *et al*, 2001; Pitman *et al*, 2000).

According to the International Agency for Research on Cancer; worldwide, the incidence of head and neck cancers is higher for males than females (Ferlay et al, 2008). Intraoral and oropharyngeal tumors are more common among men than women, with a male: female ratio of 1.5:1 for mouth and about 2.8:1 for cancer of oropharynx (Warnakulasuriya, 2008). However, the gender gap has been slowly narrowing over the past half century, probably because more females are exposing themselves to known oral carcinogens such as tobacco and alcohol (Silverman, 1998).

In a survey of Maryland, US dentists only 35% reported that the majority of oral cancer is diagnosed in patients 60 years or older (Canto *et al*, 2001).

The high risk age group for oral cancer was identified as the fourth and fifth decades by 59% of the dentists in Bonglore city in India (Vijay Kumar and Suresan, 2012). Nearly all dentists in the United States (97%) reportedly favor an oral cancer examination in patients of 40 years of age or older (Yellowitz *et al*, 1998). In UK, dental specialists identified that the trend in the incidence of oral cancer was towards younger rather than older groups. Furthermore, that there was also a trend in gender shift towards an increase in females over males during the last 5 years (Kujan *et al*, 2006).

2.5 Survival and mortality rates

Despite advances in surgery, radiation, and chemotherapy, the five-year survival rate for oral cancer has not improved significantly over the past few decades and it remains at about 50 to 55 percent (Neville and Day, 2002). Mortality resulting from oral cancer is strongly correlated with the stage of diagnosis, as detection of earlier, lower-staged lesions is associated with significantly improved survival with lower morbidity (Silveira *et al*, 2007). In the majority of cases, cancer is diagnosed in stages 3 and 4 with lymph node metastasis; the five-year survival rate is 75 percent for those with localized disease at diagnosis, but only 16 percent for patients in the late stage (Silverman and Gorsky, 1990).

2.6 Early presentation of oral cancer

2.6.1 Potentially malignant Disorder (PMD)

Many oral cancer cases appear de novo in the oral mucosa but some are preceded by pre-existing oral diseases such as leukoplakia (white patch), erythroplakia (red patch), lichen planus and submucosal fibrosis. The term oral potentially malignant disorders (OPMD) was recommended by an international working group convened by the WHO Collaborating Centre for Oral Cancer and Pre-Cancer in London in 2005 (Neville *et al*, 2009). People with OPMD have an increased risk of progressing to malignancy (Reibel, 2003; Carew *et al*, 2003).

The malignant transformation of OPMD lesions varies according to site, gender, duration and from population to population (Reibel, 2003). A higher risk of malignant transformation occurs in the lesion of the floor of the mouth and lateral border of the tongue. Females were found to develop OSCC in OPMD more frequently than males, and those have never used tobacco appear to be at greater risk than smokers (Napier, 2008).

The differential diagnosis of OC comprise benign conditions that may resemble squamous cell carcinoma and include benign hyperkeratosis, lichen planus, lichenoid drug reaction, Behçet disease, major aphthae, erythematous candidiasis, areata migrans (geographic tongue), papilloma, verruca vulgaris and snuff keratosis .

2.6 .2 Diagnosis of oral carcinoma

The clinical appearance of oral cancer lesions is usually subtle and asymptomatic. These lesions often begin as a white or red patch that advance to an ulceration and later develop into an endophytic or exophytic mass (Gonsalves et al, 2007). The gold standard for oral cancer diagnosis remains a tissue biopsy with a pathologic assessment, but this technique usually requires a trained health care provider, and is considered invasive, painful, expensive, and time consuming. In addition to a medical history, clinical presentation and tissue biopsy, a number of procedures may be useful in diagnosing oral cancer. Toluidine blue dye in a 1% aqueous solution is used to determine excessive mitotic activity or mucopolysaccharide production, findings that may be suggestive of squamous cell carcinoma (Zhang, 2005). Another potentially useful procedure - exfoliative cytology - involves the removal of cells with a cytology brush. This painless procedure is reported to have high sensitivity and specificity (Pektas, 2006).

Applebaum and colleagues (2009) found that 57% of dentists and 24% of physicians correctly identified the most common symptom of early oral cancer. However, only 34% of dentists and 10% of physicians could identify erythroplakia and leukoplakia as the two conditions most likely to be associated with oral cancer (Applebaum *et al*, 2009). Non-scrapable white patches were identified as the most common form of early manifestation of oral cancer by 82% of dentists in Bangalore, India (Kumar and Suresan, 2012).

While, 95% of Spanish dentists were aware that leukoplakia and erythroplasia are mucosal lesions mostly associated with oral cancer (López-Jornet *et al*, 2011), and two thirds of dentists in New York State correctly identified that enlarged lymph nodes typically present in patients with oral cancer as hard, painless, and either mobile or fixed (Gajendra *et al*, 2006), Italian dentists showed significant gaps in knowledge with respect to the diagnostic procedures since only one third of them could correctly identify early oral cancer lesions (Colella and Gaeta, 2008).

2.7 Examination and detection of oral cancer

The primary method for detecting oral cancer is a comprehensive oral cancer examination that includes a thorough history and physical examination (Sciubba, 2001). The history should cover the social and medical history, as well as risk behaviors such as tobacco and alcohol use. The determination of risk is vital in assessing the potential for oral cancer and the need for tobacco cessation counselling (Horowitz *et al*, 2000). The physical examination involves digital palpation of the neck node regions, bimanual palpation of the floor of mouth and the tongue, and inspection with palpation and observation of the oral and pharyngeal mucosa with an adequate light source and mouth mirror. The complete examination can take as little as 90 seconds to perform, although few health practitioners and dentists in particular, conduct such examination (Horowitz *et al*, 2001).

One of the objectives of Healthy People 2010 is to increase the percentage of oral and pharyngeal cancers (Stage I, localized) detected at the earliest stage to 50%. The American Cancer Society recommends oral cancer examination annually for people 40 years and older (Smith *et al,* 2007). The Canadian Task Force for Preventive Health suggests annual screening for patients at high risk (Hawkins *et al,* 1999).

Most Spanish dentists (89.7%) were of the opinion that oral cancer examinations should be provided annually for patients aged 40 and older (López-Jornet *et al*, 2011). Such routine examination was conducted by 86% of Texas dentists (Dodds et al, 1994), 83% of Maryland dentists (Yellowitz and Goodman, 1995) and 92% of dental specialists in the UK. Moreover, 84% of dentists in the UK said that they performed a systematic examination of the oral mucosa irrespective of the patient's presenting symptom and 91% of the dentists spent less than 3 minutes for an oral mucosal examination (Warnakulasuriya and Johnson, 1999).

Half of the Italian dentists routinely perform an oral cancer examination on all patients (Colella and Gaeta, 2008). A 2004 study of Illinois dentists found that 92.3% reported performing an oral examination on asymptomatic patients, and 40.6% said they do so at least annually (LeHew and Kaste, 2007). In New York, 86% of dentists reported oral cancer examinations at initial examination and 80% at recall examinations (Cruz *et al*, 2005).

2.8 Screening for oral cancer through visual examination

Opportunistic screening of the oral mucosa during regular dental care should be undertaken as part of routine dental examinations with special attention given to patients presenting with the risk factors that are associated with oral cancer. It is recommended as a proactive preventative measure that may result in reduced morbidity and mortality from oral cancer (Warnakulasuriya and Johnson, 1996). A 2006 Cochrane review found insufficient evidence for or against the effectiveness of visual screening of the general population (Kujan *et al*, 2006).

The sites of involvement of oral cancer are easily visible and accessible to a dental professional during a routine dental examination without requiring specialized equipment and techniques (Petersen, 2008; WHO, 2005). More than 95% of UK dentists used a visual examination for oral cancer screening because this technique is inexpensive, simple, and acceptable and has high sensitivity and specificity (Kujan *et al*, 2006).

2.9 Updated knowledge on oral cancer

Continuous updating of oral cancer knowledge through postgraduate programs is essential to enhance dental professionals' knowledge of oral cancer risk factors and diagnostic concepts. Two contemporaneous reports from studies carried out among dentists in the United States; when asked if their knowledge on oral cancer was current and up-to-date or not; a large proportion (72%) of dentists In New York State agreed that their knowledge was current (Gajendra *et al*, 2006). Similarly; almost three-fourths of the US dentists strongly agreed or agreed that their knowledge of oral cancer is current (Yellowitz *et al*, 1998).

An overall 56.7% of dentist in British Columbia and Nova Scotia agreed that their knowledge of oral cancer was current. While, 32.1% and 29.8% of dentists in the two provinces disagreed that their knowledge was current (Clovis *et al*, 2002). On the other hand only half of 50 % of dentists in Massachusetts agreed or strongly agreed that their knowledge about oral cancer was up to dated (Applebaum *et al*, 2009).

2.10 Training and continuing education

2.10 .1 Opinions on adequacy of training

The training of dentist to diagnose early cancerous lesions is neither uniform nor routinely updated, and they largely are inadequately trained (Yellowitz *et al*, 1998; Horowitz *et al*, 2000; Forrest *et al*, 2001; LeHew and Kaste, 2007). Smith *et al*. (1995) reported that a systematic soft tissue screening during routine dental care is an area of professional practice that could improve with further training.

Only 50% of general dental practitioners in UK when asked about their training in providing oral cancer examinations described their training as sufficient (Kujan *et al*, 2006) while 88 percent of US general dentists strongly agreed or agreed that they were adequately trained to detect early oral cancer lesions (Yellowitz *et al*, 1998) and Colella *et al.* (2008) reported that 64.8% of Italian dentists believed that they were prepared to perform an oral cancer examination and to palpate lymph nodes in patients' necks.

2.10.2 Undergraduate education on oral cancer

In a survey of 86 U.S. medical schools, Ahluwalia and colleagues (2005) found that the curriculum covering oral cancer and oral examinations was brief and incomplete (Ahluwalia *et al*, 2005). Dentists who rated their undergraduate oral cancer training favorably were more likely to agree that their oral cancer knowledge was current than those who rated their undergraduate training unfavorably (Alonge and Narendran, 2003).

Current undergraduate curricula and continuing education for graduates could effectively address the training gaps through a range of educational strategies (Clovis *et al*, 2002). Regulatory guidance for educational curricula is essential to ensure proficiency; such a standard that could serve as a catalyst for clinical licensing examination boards to assess competency in conducting oral cancer examinations.

2.10.3 Continuing Education on oral cancer

Epidemiological studies have shown that dentists and other health care workers need systematic educational updates in oral cancer prevention and early detection (Horowitz *et al,* 2000). Dentists report attending continuing education (CE) programmes on oral cancer early detection which suggests that many perceive a need to update their knowledge and early detection skills (Canto *et al,* 2001; Alonge and Narendran, 2003; LeHew and Kaste, 2007).

Barker *et al.* (2001) found significant changes in knowledge and perceived competency with respect to the diagnosis of oral and pharyngeal cancer after a multi-component educational intervention was targeted at health care professionals. Optimally, educational programs should focus on risk factor screening, behaviour modification counseling, physical examination of the oral cavity and a review of the criteria for referral to a specialist for a biopsy, definitive diagnosis and treatment (Kumar and Suresan, 2012). Dental education institutions should establish and disseminate regular training opportunities for students and dentists to keep their knowledge and skills current, and to improve the quality of service they provide to their patients (LeHew *et al*, 2010).

Dentists who attended an educational course in the preceding year on oral cancer were more likely to have a higher level of knowledge of oral cancer itself, an apparent positive attitude that they were adequately prepared about oral cancer, and the tendency to routinely perform an oral cancer examination on all patients. Similar findings have been found in many studies among dentists practicing in the United States (Clovis *et al,* 2002; Horowitz *et al,* 2000; Alonge and Narendran, 2003) and Italy (Colella and Gaeta, 2008).

2.11 Smoking cessation and alcohol reduction counseling

Studies have shown that a 10 minute quit-smoking consultation by a health professional will assist 3% more smokers to abstain from smoking for six months or longer compared to those who receive no advice (Parrott *et al*, 1998).

The United States Preventive Services Task Force recommended that appropriate counseling should be offered to those persons who smoke cigarettes, pipes, or cigars, those who use chewing tobacco or snuff, and those who demonstrate evidence of alcohol abuse.

Most dentists in the UK disagreed that they were adequately trained to provide alcohol or tobacco cessation education and were not very well disposed to providing health education to their patients on alcohol cessation (Warnakulasuriya and Johnson, 1999). These results are consistent with findings of low rates of tobacco- and alcohol-use cessation counseling among dentists in other studies (Clovis *et al*, 2002; Kujan and Duxbury, 2006; Cruz *et al*, 2005)

In Ireland when asked about dentists' training needs most of dentists expressed an interest in furthering their education regarding oral cancer and the vast majority identified the "recognition of suspicious lesions" and on "suspicious lesions referral guidelines" alcohol (74%) and tobacco (79%) cessation counseling and education were the least selected options (Decuseara *et al*, 2011).

2.12 Referral practices

Early identification of suspected patients with oral cancer and speedy referral to a specialist for treatment are considered to be an important part of primary dental care (Fisher, 2000). Patients referred for suspected cancer should have the opportunity to make informed decisions about their care and treatment. Professional delay is defined as the time from the first consultation with a healthcare professional to the first consultation with a treating specialist (Allison *et al*, 1998).

The reasons and extent of the referral delays at the different stages between a patient first noticing an oral lesion and then being referred for specialist care have previously been studied and consistently found to be longer than desired. A number of studies have reported referral delays of oral cancer in Australia (Dimitroulis *et al*, 1992), Brazil (Kowalski *et al*, 1994), United Kingdom (Hollows *et al*, 2000), Denmark (Wildt *et al*, 1995) and Greece (Pitiphat *et al*, 2002), however the studies are not easily comparable because they were set in different areas and used different methodologies.

Development of local protocols and referral arrangements for patients with suspected oral cancer is recommended for a local CPD/audit session, where invited dental practitioners and primary healthcare workers can meet with the relevant specialists in the secondary care sector (Conway *et al*, 2000). In 2000, the United Kingdom Department of Health published a set of referral guidelines recommending that all patients referred with suspected cancer should be seen by their local specialist unit within a period of two weeks.

Such a referral letter should be addressed to a named consultant or specialist and give (British Dental Association, 2000):

- Patient personal details (age, sex, personal details, occupation).
- Relevant medical history details (or a copy of the medical history record).
- Relevant lifestyle factors.
- Brief details of counseling provided and perceived level of patient understanding of the situation.
- Brief dental history (attendance patterns, oral hygiene and periodontal condition).
- Details of the suspect area/lesion (colour, texture, size, position, mobility).
- Whether any regional nodes are palpable.
- Copy of completed mouth map.
- Copy of previous mouth map if lesion has been under review.
- Intra-oral photographs of visible lesion or stained area (if available).
- If applicable, mention results from chair side tests
- Thanks for agreeing to see the patient and a request for an opinion and test results.

Finally, oral cancer is a an important public health problem it should always be considered in such patients when they present with persistent ulceration, leukoplakia, erythroplakia or swellings with no obvious local cause, particularly in the high-risk sites of the tongue and floor of the mouth. For any such lesion, a referral is recommended to the nearest specialist center accompanied by a detailed referral letter. This will ensure prompt investigation and initiation of treatment which may increase the chances of successful treatment.

Chapter 3: Aim and Objectives

3.1 Aim

To determine dentists' knowledge, attitudes and practices of oral cancer in public dental clinics in Khartoum State.

3.2 Objectives

1. To determine the knowledge, attitudes and practices of dentists to the signs and symptoms of oral cancer.
2. To provide base line data for planning oral health services in Khartoum State.
3. To make recommendation for continuing professional education programmes.

Chapter 4: Methodology

4.1 Study design

A descriptive, cross sectional survey.

4.2 Study site and study population

All the 130 registered dentists practicing in Public Dental Clinics in Khartoum State were included in the study. The lists of dentist working in these public dental clinics were obtained from Directorate of Oral Health, Ministry of Health Khartoum State, Khartoum Dental Hospital, Bahri Dental Hospital, Police Dental Hospital, and Army Medical Corporation Hospital.

4.3 Data collection tool

This study aimed to obtain baseline information to assist with the planning of evidence-based oral health services. An administered, structured questionnaire was used for collecting the data (Appendix 1). It consisted of 28 questions that designed to investigate demographic attributes, oral cancer knowledge and dental practice characteristics. In addition, there were questions about respondents' opinions regarding oral cancer prevention and early detection. Data collection was conducted from November to December 2010.

4.4 Pilot study

The pilot study was carried out to:

(i) Test the suitability of the method of collecting the data.
(ii) Test how long each examination will take to complete.
(iii) Check the adequacy of the data capture sheet.
(iv) Check that all the parameter measurements are clear and unambiguous.
(v) Ensure that no major item has been omitted and;
(vi) Remove any items that do not yield usable data.

Participation in the pilot study was voluntary and informed consent was signed after information regarding the research aim and objectives were provided to the participants. Following the pilot study, irrelevant and problematic items were identified, deleted or reformulated. The final questionnaire was concise, easy to understand and ensured minimum participant error.

4.5 Data collection

The principal researcher and one dentist participated in data collection process. A standardisation and calibration ensured uniformity in the administration of the questionnaire and the interview procedure. The use of uniform wording of questions and nonverbal signals was taken into account.

4.6 Data analysis

The collected data was categorized, coded and entered into the computer. The data was captured in Excel. Basic descriptive analysis was done using the Excel environment. The database was imported into SPSS® to perform complex statistical analyses. Descriptive statistics was used to describe the demographic factors. The independent t-test was used to determine associations between the scale variables of the sample. The Mann-Whitney U test was used to determine the association between nominal and the ordinal variables. Chi square tests were used for other associations.

4.7 Ethical considerations

Permission to carry out the present study was obtained from the Senate Research Ethics Committee of the University of Western Cape and the Oral Health Directorate, Ministry of Health Khartoum State. Signed informed consent (Appendix 2) was obtained from each participant prior to interviews being conducted. Participation was entirely voluntary and the participants were allowed to withdraw from the study at any time should they wish to do so without any penalties. It was emphasized that strict confidentiality would be maintained at all times and that none of their names or personal details will be mentioned in the write up of the study. Anonymity was achieved by not using the participant's names on the questionnaire and the questionnaire was recorded with serial numbers.

Chapter 5: Results

5.1 Demographic information

One hundred and thirteen public health dentists participated in the study giving a response rate of 86.92%. The majority were female (68.1%). Forty five percent were aged between 20-30 years old and 41.6% between 31-40 years old. Just over a third (35.4%) were in dental practice for less than 5 years; while and 42.5% graduated from dental school 6 to 10 years ago. Only 10.6% were in practice for more than 15 years (Table1).

Table 1: Demographic and practice characteristics of respondents

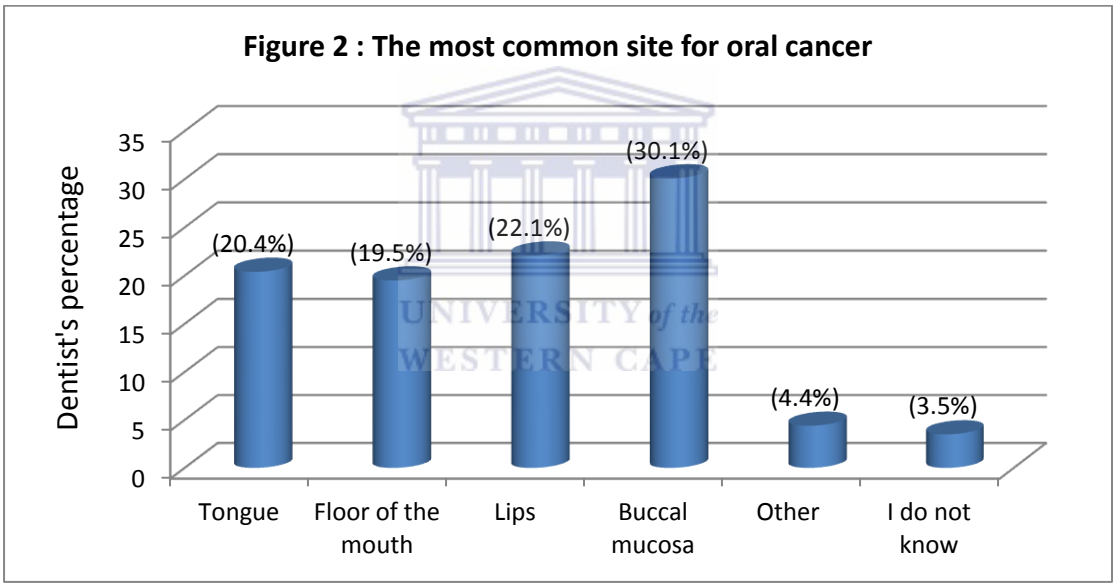
Characteristics	Number	Percent (%)
Gender		
Male	**36**	**31.9**
Female	**77**	**68.1**
Total	**113**	**100**
Time since graduation (years)		
3 – 5	**40**	**35.4**
6 – 10	**48**	**42.5**
11 – 15	**12**	**10.6**
More than 15	**12**	**10.6**
Total	**113**	**100**

5.2 Oral Cancer knowledge

Over 90% (n=104) correctly responded that squamous cell carcinoma is the most frequent histological type of oral cancer (Table 2). Regarding oral cancer location, 30.1% selected the buccal mucosa; and 22.1% the lips as most common site. The tongue (20.4%) and the floor of the mouth (19.5%) were almost equally identified by the respondents (Figure 2).

Table 2: The most frequent histological type of oral cancer

Type of oral cancer	Number	Percent (%)
Kaposi's sarcoma	**4**	**3.5**
Squamous cell carcinoma	**104**	**92.0**
Hodgkin's lymphoma	**1**	**9**
Osteogenic sarcoma	**1**	**9**
Don't know	**3**	**2.7**
Total	**113**	**100**



More than half the respondents (58.4%) reported that the majority of oral cancers develop in patients between 40-59 years of age; but only 40 respondents (35.4%) correctly identified the age group of 60 years and older as the cohort in whom the majority of oral cancers are diagnosed.

5.2.1 Oral cancer risk factors

Participants were asked to rank the risk factors for oral cancer from the most important (1) to the least important (5) (Table 3). Over the quarter of the participants (38.9%) reported that tobacco use is the most important risk factor (ranked 1), with chronic diseases as second most common risk factor (60%).

Table 3: Ranking of risk factors for oral cancer

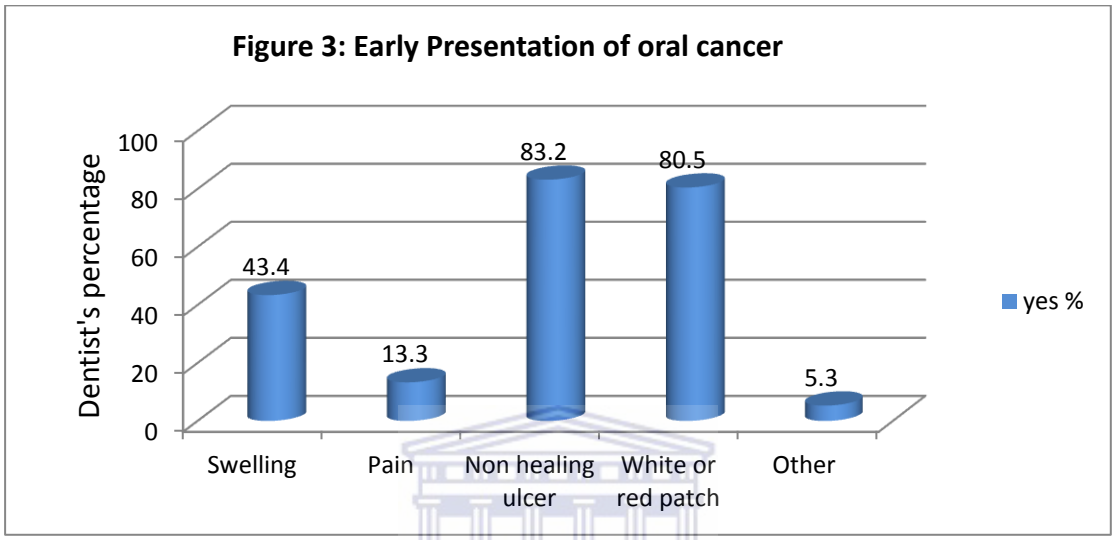
Oral cancer risk factor	The percentage of dentist's Choices (%)				
	1st	2nd	3th	4th	5th
Use of tobacco	**38.9**	**8.0**	**16.8**	***30.1***	**6.2**
Exposure to sun	**31.9**	**4.4**	**9.7**	**18.6**	**35.4**
HIV infection	**16.8**	**6.2**	**31.0**	**20.4**	**25.7**
Alcohol consumption	**15.0**	**21.2**	**25.7**	**19.5**	**18.6**
Chronic diseases	**0.9**	**59.3**	**15.9**	**8.0**	**15.9**

Almost two thirds (64.6%) reported that family history of cancer was an increased risk factor of development of oral cancer. Interestingly, a considerable number (70.8%) were unaware that a low consumption of fruits and vegetables is also a risk factor for oral cancer. Viral infections (60%) and poorly adjusted dentures (41.6%) were also identified as risk factors (Table 4).

Table 4: Factors that increasing the risk for oral cancer

Risk factors	Yes		No	
	Number	Percent	Number	Percent
Family history of cancer	**73**	**64.6**	**38**	**33.6**
Low consumption of fruits and vegetables	31	27.4	80	70.8
Obesity	**5**	**4.4**	**106**	**93.8**
Poorly adjusted dentures	41.6	47	64	56.6
Viral infections	**77**	**68.1**	**35**	**31.0**

Figure 3, shows that the majority of the dentists, correctly choose non-healing ulcer (n=98, 83.2%) and white or red patch (n=91, 80.5%) as early lesions of oral cancer.
A large number (n = 98; 86.7 percent) correctly reported that pain is not usually associated with the early presentation of oral cancer. Forty three percent indicated that swelling is an early symptom.

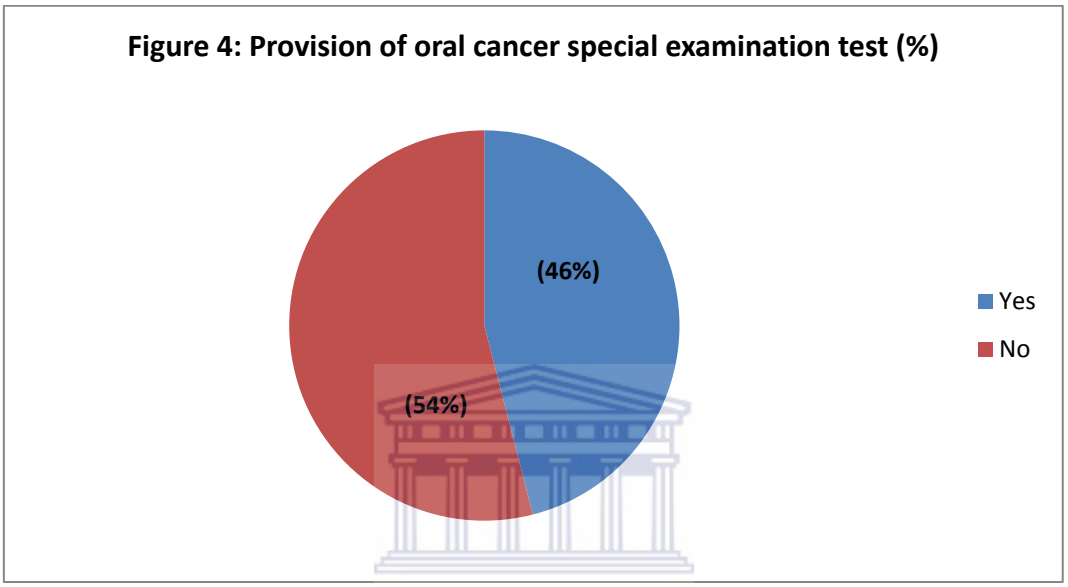


Nearly a third of the respondents (31.9%) categorized the survival rate of oral cancer as being between 4-6 years and about two thirds that the mortality rate was greater among males patients.

5.3 Oral Cancer practice

5.3.1 Oral cancer examination

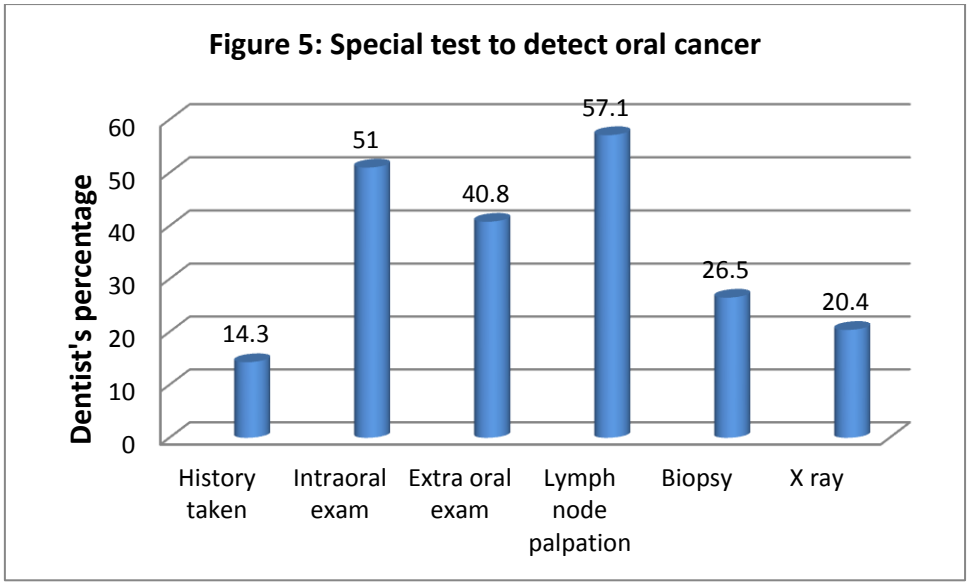
Interestingly, almost half (54 percent) of the sample of dentists reported that they do not carry out any special examination to detect oral cancer for asymptomatic patients (Figure 4).



Among those who reported that they do (n=52; 46%), only seven (14.3%) said that they took a medical history. Fifty one percent (n=25) said that they do only intra oral examination to detect oral cancer, while 40.8 percent of them (n=20) perform only extra oral examination. Fifty seven percent reported that they carry out a lymph node palpation, and a quarter performed a biopsy and did a radiographic examination (Table 5; Figure 5).

Table 5: Special test to detect oral cancer

Special test to detect oral cancer	Number	Percent
History taken	**7**	**14.3**
Intraoral examination	25	51.0
Extra oral examination	**20**	**40.8**
Lymph node palpation	28	57.1
Biopsy	**13**	**26.5**
X ray	10	20.4



Dentists who performed an oral cancer examination were asked to estimate the relative time they spent in carrying out such an examination (Table 6). Fifty nine percent (59.6%) reported that they spent more than 5 minutes for an oral cancer examination, 34.6% estimated that they would spend 3-5 minutes and 3.8% less than 3 minutes.

Table 6: Time may spend if they do oral cancer examination

Time	Number	Percent (%)
less than 3 minutes	2	3.8
3-5 minutes	**18**	**34.6**
More than 5 minutes	31	59.6
Total	**51**	**98.1**
Missing	1	1.9

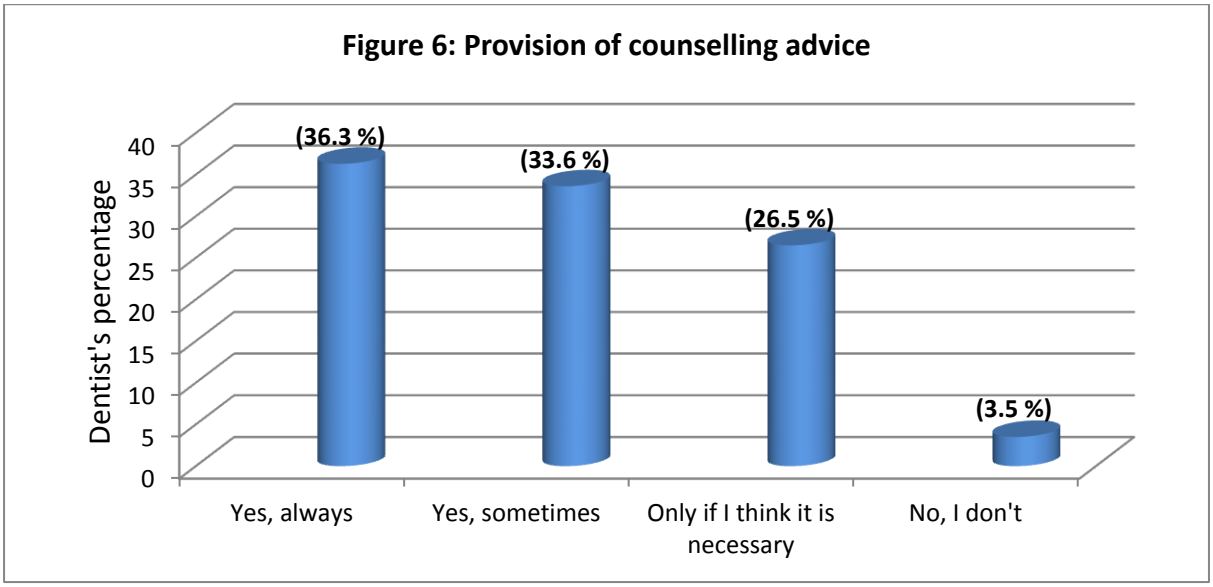
The most important reasons given by respondents for not providing oral cancer examinations were "I am not trained enough" (67.2%) and 14.8% because "It's not necessary for all patients" (Table 7).

Table 7: Reasons for not providing oral cancer examinations

Reasons	Number	Percent (%)
Because it is time consuming	**1**	**1.6**
Because I am not trained enough	41	67.2
Because it is not necessary for all patients	**9**	**14.8**
Others	8	13.1
Total	**59**	**96.7**
Missing	2	3.3

5.3.2 Risk factor counselling intervention

Figure 6 summarizes how frequently counselling intervention is provided by dentists for patients. 36.3% (n=41) of participants, always discuss the risk factors of oral cancer with their patients.



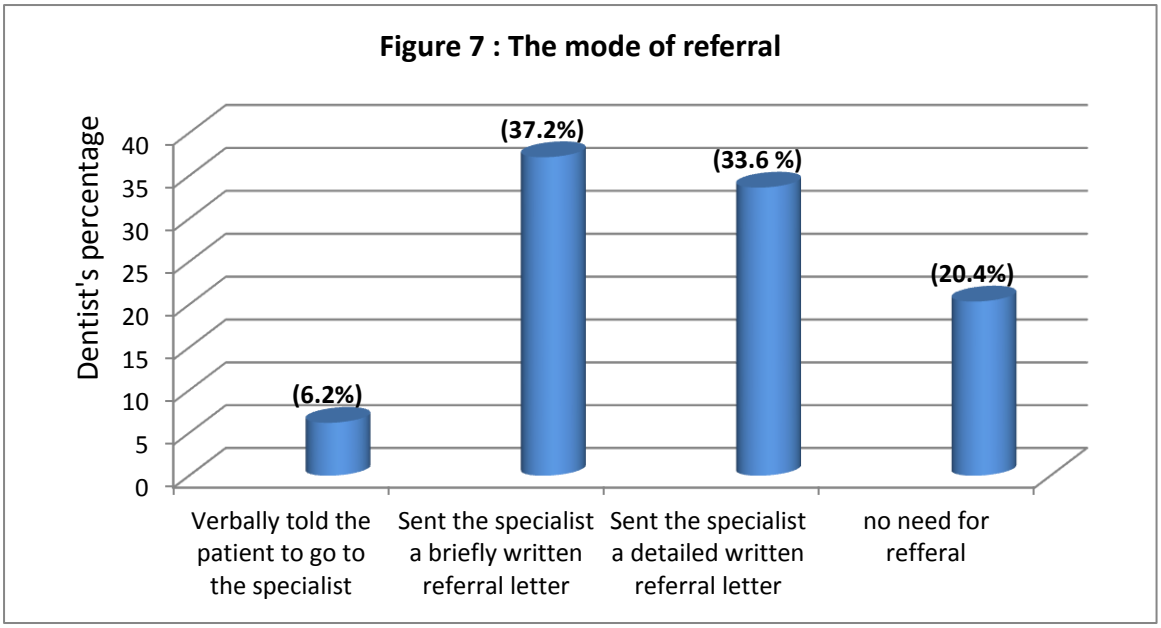
Half of the dentists who do not provide risk factors counseling intervention, felt that they were not adequately trained to provide such advice, and the remaining quarter reported that counselling advice would not be effective (Table 8). Sixty three percent (n=72) reported that they did not have any educational materials for patients regarding the risks of oral cancer in their clinics.

Table 8: Reasons for not providing counselling intervention

Reasons	Number	Percent (%)
I am not trained enough to provide such advice	2	50.0
I think this would not be effective	**1**	**25.0**
Total	3	75.0
Missing	**1**	**25.0**

5.3.3 Referral practice

Just over half (52.2%) had referred about one to five patients to a specialist for a suspicious oral cancer lesion during the 12 months prior to the present study. 37.2% reported that the referral was with a brief written letter, 33.6% a detailed letter including a comprehensive description of the lesion, and 6.2% verbally asked the patient to seek specialist advice (Figure 7). The majority (88.5%) believed that referral guidelines can improve the quality of referrals to a specialist dental surgeon.



5.4 Oral Cancer Knowledge

Only 26.7% perceived that their knowledge on oral cancer was current and up-to-date, 35.3% reported that they did not have sufficient knowledge concerning oral cancer prevention and 36.3% did not have sufficient knowledge in the diagnosis of oral cancer (Table 9).

Table 9: Dentists belief about their knowledge on oral cancer prevention and diagnosis

Belief about knowledge	Yes	No	Don't know	Total
Knowledge up-to-date	29	66	18	113
Sufficient OC prevention knowledge	**56**	**40**	**17**	**113**
Sufficient OC diagnosis knowledge	58	41	14	113

5.5 Oral Cancer training

Nearly two thirds of the dentists (66.4%) said "No" when asked if they had sufficient training to detect oral cancer lesions. Overall, 50.4% (n=57) thought that screening for oral cancer through visual examination was an ineffective method for its early detection (Table 10).

Table 10: Dentist's beliefs about their knowledge on oral cancer prevention and diagnosis

Attitude	Yes		No		Don't know		Total
	n	%	n	%	n	%	
Your under-graduate training in the diagnosis of oral cancer was adequate	**31**	**27.4**	**75**	**66.4**	**7**	**6.2**	**113**
Screening for oral cancer through visual examination is an effective method for its early detection	**52**	**46.0**	**57**	**50.4**	**4**	**3.5**	**113**
Development of referral guidelines can improve the quality of referrals	**100**	**88.5**	**4**	**3.5**	**9**	**8.0**	**113**
Interest on continuing education regarding the examination and early detection of oral cancer	**108**	**95.6**	**5**	**4.4**	**0**	**0**	**113**

5.6 Associations

5.6.1 The association between demographic characteristics and oral cancer knowledge

There was a significant relationship between the time of graduation and the knowledge of the most common type of oral cancer (*p value* = 0.020). Recent graduates were more likely to identify the correct answer (Table 11).

Table 11: The association between the time since graduation and oral cancer knowledge

Oral cancer knowledge	The percentage of dentists according to time since graduation (%)				p-value
	3 – 5	6 – 10	10- 15	More than 15	
Kaposi's sarcoma	0.0	4.2	0.0	16.7	0.020
Squamous cell carcinoma	***97.5***	93.8	83.3	75.0	
Hodgkin's lymphoma	2.5	0.0	0.0	0.0	
Osteogenic sarcoma	0.0	2.1	0.0	0.0	
I do not know	0.0	0.0	16.7	8.3	

** Chi square test, p value < 0.05 (significant).*

5.6.2 The association between demographic characteristics and oral cancer examination behavior

Although half of the dentists who performed special tests to detect oral cancer were between 20 to 40 years old, there was no significant difference between the different age groups (Table 12). Neither was there a statistically significant difference between genders, nor regarding time since graduation.

Table 12: The association between demographic characteristics and performing special tests to detect oral cancer practice.

Variable	Categories	Dentist perform special test to detect oral cancer		
		Number	%	p-value
Age	20 – 30	25	49	0.453
	31 – 40	23	48.9	
	41 – 50	2	25	
	≥ 50	2	28.6	
Gender	Male	19	52.8	0.324
	Female	33	42.9	
Time since graduation	3 – 5	20	50	0.427
	5 – 10	24	50	
	10- 15	3	25	
	More than 15	5	41.7	

** Chi square test, p value < 0.05 (significant)*

5.6.3 Demographic characteristics and attitudes

There was a significant difference between males and females regarding oral cancer knowledge (*p value* = 0.033) (Table 13). In addition, there was a significant relationship between the time since graduation and the effectiveness of a visual examination in early detection of oral cancer (*p value* = 0.714).

Table 13: The association between the demographic characteristics and oral cancer attitude

Variable	Categories	Do you think that your Oral Cancer knowledge was current						
		Yes		No		Don't Know		p-value
		n	%	n	%	n	%	
Age	20 – 30	12	23.5	30	58.8	9	17.6	0.582
	31 – 40	15	31.9	24	51.1	8	17	
	41 – 50	1	12.5	6	75	1	12.5	
	≥ 50	1	12.3	8	85.7	0	0	
Gender	Male	10	27.8	25	69.4	1	2.8	0.033
	Female	19	24.7	41	53.2	17	22.1	
Time since graduation	3 – 5	11	27.5	24	60	5	12.5	0.714
	5 – 10	15	31.3	25	52.1	8	16.7	
	10- 15	1	8.3	9	75	2	16.7	
	More than 15	2	16.7	8	66.7	7	16.7	

** Chi square test, p value < 0.05 (significant).*

5.6.4 Referral practice vs. the attitude to development of referral guidelines

There was a significant relation (p = 0.033) between referral practice and the need for referral guidelines (Table 14) and most of the dentists who refer patients to oral cancer specialists encourage the development of standardized referral guidelines.

Table 14: Referral practice vs. development of referral guidelines

Variable	Dentist who agree to develop a referral guidelines		
	Number	**%**	***p-value***
Verbally told the patient to go to the specialist	6	85.7	0.033
Sent the specialist a briefly written referral letter	36	85.7	
Sent the specialist a detailed written referral letter including detailed description of the lesion.	37	97.9	
No need for referral	18	78.3	

** Chi square test, p value = 0.033, p value < 0.05 (significant)*

Lastly, when the dentist was asked about continuing education, the vast majority (95.6%) reported that they were interested in further continuing education regarding the prevention and early detection of oral cancer.

Chapter 6: Discussion

Understanding knowledge, attitudes, and practices of dental professionals is vital in order to determine their effectiveness in the prevention and early detection of oral cancer (Horowitz *et al,* 2000). An 86.92% response rate of the present study is high compared with previous studies from UK (Warnakulasuriya *et al,* 1999; Kujan *et al,* 2006), Italy (Colella and Gaeta, 2008) and Spain (López-Jornet *et al,* 2010).

6.1 Oral cancer knowledge

Most of the dentists in the present study knew that Oral Squamous Cell Carcinoma (OSCC) is the most common form of oral cancer, similar to finding from USA and Spain (Yellowitz *et al,* 1998; López-Jornet *et al,* 2010). Regarding oral cancer location, 30.1% of the dentists selected the buccal mucosa and 22.1% chose the lips as most common site. In contrast, Italian dentists select tongue and floor of the mouth as the two most common sites for of oral cancer (Colella and Gaeta, 2008).

Although, recent reports indicate an increasing trend of oral cancer among young males, particularly cancer of the tongue, oral cancer remains largely a disease of the elderly (Shiboski *et al,* 2000). In the present study only 35.4% of the respondents correctly identified the age group of 60 years and older to develop oral cancer ; this figure is low in comparison to similar studies carried out in USA (Gajendra *et al,* 2006), Canada (Clovis *et al,* 2002) and Spain (López-Jornet *et al,* 2010).

Data from a survey in Spain revealed that the majority of dentists are aware that leukoplasia and erythroplasia are mucosal lesions associated with oral cancer (López-Jornet *et al,* 2010). Likewise, in this study over 80% of dentists knew that white or red patches are the main precancerous lesions associated with oral neoplasia. The majority reported that pain is not usually associated with the early presentation of oral cancer. In the same way, Decuseara and his colleagues in Ireland found that most of the dentists knew that a patient is usually asymptomatic during the initial stages of the disease (Decuseara *et al,* 2011).

The vast majority of dentists in the present study correctly identified alcohol and tobacco as the main risk factors, similar to other studies previously carried in USA (Patton *et al,* 2005), Canada (Clovis *et al,* 2002) and Europe (López-Jornet *et al,* 2010). 70.8% of the dentists were unaware that low consumption of fruits and vegetables is also a risk factor for oral cancer (Decuseara *et al,* 2011).

Nearly a third of the respondents categorized the survival rate of oral cancer as being between 4-6 years. In comparison, the majority of dentists surveyed in Spain and Ireland were of the opinion that early detection improves 5 years survival rates from oral cancer (López-Jornet *et al,* 2010; Decuseara *et al,* 2011).

6.2 Oral Cancer Practice

More than half of the sample dentists reported that they do not carry out any special examination to detect oral cancer for asymptomatic patients. These findings are consistent with another dentist survey from Italy (Colella and Gaeta, 2008). In contrast, over ninety percent of the dentists from Western US reported that they provide oral cancer examinations for asymptomatic patients (LeHew and Epstein, 2010), as well as, dentists from Illinois US (LeHew and Kaste, 2007).

In the present survey about 60% of the dentist spent more than 5 minutes for an oral cancer examination. In comparison, Warnakulasuriya et al (1999) reported that most of dentists in UK spent less than 3 min for an oral mucosal examination (Warnakulasuriya and Johnson, 1999). Most important reasons given by respondents for not providing oral cancer examinations were “I am not trained enough” and “It’s not necessary for all patients”. These finding was consistent with a dentist survey conducted in New York in 2006 (Gajendra *et al,* 2006).

6.2.1 Risk factor counseling intervention

Regarding the role of the dentist in providing risk factor counseling intervention; half of the dentists who do not provide risk factors counseling intervention felt that they are not trained enough to provide such advice. The remaining dentists think that this counseling advice would not be effective.

In the reviewed literature, low rates of tobacco- and alcohol-use cessation counseling were also reported in other studies (Warnakulasuriya and Johnson, 1999; Clovis *et al,* 2002; Kujan and Duxbury, 2006; Cruz *et al,* 2005).

Lack of patient education materials (brochures, leaflets, posters) regarding prevention and early detection in dental clinics was observed. This is similar to Irish dental survey where 74 % of dentists reported the same finding (Decuseara *et al,* 2011).

6.2.2 Referral Practice

López-Jornet *et al.* (2001) in Spanish dental survey found that the mean annual number of referral is 3.8 - 7.4 patients. This figure is slightly higher than the present study results, in which over half of the respondents had referred to a specialist between one and five patients for a suspicious oral cancer lesion during the last year. Favorably, the majority believed that development of referral guidelines can improve the quality of referrals to special dental surgeon.

6.3 Oral Cancer attitude

Two thirds of the dentists reported that their knowledge on oral cancer was current and up-to-date. This result was lower than a study from Massachusetts, USA and British Columbia and Nova Scotia where around half of dentists agreed that their knowledge about oral cancer was current (Clovis *et al,* 2002; Applebaum e*t al,* 2009). Furthermore, a higher proportion (72%) of dentists in New York State agreed that their knowledge was current (Gajendra *et al,* 2006).

6.4 Oral Cancer training

A third of the sample of dentists said "No" when asked if they had sufficient training to detect oral cancer lesions, concurring with the majority of USA general dentists agreed that they were adequately trained to detect early oral cancer lesions (Yellowitz *et al,* 1998). Colella *et al.* (2008) recorded that approximately two-thirds (64.8%) of Italian dentists believed that they were prepared to perform an oral cancer examination and to palpate lymph nodes in patients' necks.

Undergraduate training related to oral cancer examination was reported as good by around half of the dentists in British Columbia and Nova Scotia (Clovis *et al*, 2002). A much lower figure was reported in this study, while only two thirds (27.4%) of the dentists believed that their undergraduate training in the diagnosis of oral cancer was adequate. Despite this, the vast majority of the respondents in the present study were interested in oral cancer continuing education.

The association between demographic characteristics and oral cancer knowledge

In the present study there was a significant relationship between the time of graduation and the knowledge of oral cancer; recent graduates were more likely to identify the correct answer. Similar findings were also reported from Ireland and Italy (Decuseara *et al*, 2011; Colella *et al*, 2008).

In summary, the present results shows that data reported on knowledge, practices and attitudes are consistent with the findings of prior surveys of dentists in different geographical regions. The results must be interpreted in the context of potential methodological limitations. Variability in dentists' clinical practice for early detection suggests a need for established practice standards that can be introduced and reinforced through training programs.

Chapter 7: Recommendations

In view of the findings of the present study, it is recommended that improving the level of knowledge of oral cancer preventive measures becomes a public health priority in any preventive strategy for the reduction of the burden of oral cancer in Sudan. Dentists are in an excellent position to bring about positive changes in reducing the rising incidence of oral cancer and ultimately saving lives.

There are opportunities for the development of a standardized oral cancer screening programme together with a uniform referral protocol for patients with suspected oral cancer. In addition, clear clinical practice guidelines that hold dentists responsible for routine and thorough oral cancer examinations and referral are needed.

Continuing education training courses need to be developed to suit the training needs of the dentists. Educational programmes should focus on risk factor screening, behavior modification counselling and physical examination of the oral cavity and a review of the criteria for referral to a specialist for a biopsy, definitive diagnosis and treatment.

Many participants described their undergraduate training in the recognition of oral cancer as insufficient. Dental curricula need to address the gaps so that future dental graduates are equipped with good clinical practice habits and knowledge regarding oral cancer prevention and detection.

In general, oral cancer prevention and early detection are significant public health concerns that require increased and sustained attention in both the health care and policy systems.

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Appendix1: Oral Cancer Questionnaire

Form No ☐☐☐ Data collector ☐ date ☐☐☐☐

- Please write the number of the right answer you choose inside the empty box.

Demographic information

1) Age (years) ☐

1. 20 – 30
2. 31 – 40
3. 41–50
4. ≥50

2) Gender ☐

1. Male
2. Female

3) Time since graduation from dental school (years) ☐

1. 3 – 5
2. 6 – 10
3. 11 – 15
4. More than 15

Knowledge

4) What is the most common oral cancer? ☐

1. Kaposi's sarcoma
2. Squamous cell carcinoma
3. Hodgkin's lymphoma
4. Osteogenic sarcoma
5. Other (please describe): ……..
6. I do not know

5) What is the most common site for oral cancer to occur? ☐

1. Tongue
2. Floor of the mouth
3. Lips
4. Buccal mucosa
5. Other (please describe): ……..
6. I do not know

6) The most common age of the patients to develop oral cancer is: ☐

1. Below 40 years
2. 40 – 59 years
3. More than 60 years
4. I do not know

7) Early presentation of oral cancer usually includes: (you can answer more than one answer)

1. Swelling ☐
2. Pain ☐
3. Non healing ulcer ☐
4. White or red patch ☐
5. Other (please describe): ……..
6. I do not know ☐

8) The survival rate of oral cancer ranges between: ☐

1. 1-3 years
2. 4-6 years
3. ≥ 6 years
4. Other (please explain): ……
5. I do not know

9) The mortality rate of oral cancer is greater among ☐

1. Males
2. Females
3. I do not know

10) Rank from (1 – 5) the risk factors for oral cancer according to the most important (1) and least important (5). Ensure that you put a number in every box provided

1. Chronic diseases ☐
2. Use of tobacco ☐
3. HIV infection ☐
4. Alcohol consumption ☐
5. Exposure to sun ☐

11) Which of the following is a risk factor for oral cancer? (You can answer more than one answer)

1. Family history of oral cancer ☐
2. Low consumption of fruits and vegetables ☐
3. Obesity ☐
4. Poorly adjusted dentures ☐
5. Viral infections ☐
6. I do not know ☐

Practices

12) Do you do any special tests or examinations to detect oral cancer lesions? ☐

1. Yes
2. No

- if you have answered "NO" to Q12, please go directly to Q16

13) If you answered "Yes" to question 12, what do you do – please explain:

……
……
……
……

14) If you answered "Yes" to question 12, how much time do you spend to do oral examination for oral cancer? ☐

1. Less than 3 minutes
2. 3-5 minutes
3. More than 5 mintues

15) Do you think that you have had adequate training to detect oral cancer? ☐

1. Yes
2. No
3. I do not know

16) If have answered "No"to question 12, why you do not do examinations to detect oral cancer? ☐

1. Because it is time consuming.
2. Because I am not trained enough.
3. Because it is not necessary for all patients.
4. Other (please explain): ……

17) Do you discuss the risk factors of oral cancer with your patients? ☐

1. Yes, always
2. Yes, sometimes
3. Only if I think it is necessary
4. No, I do not

18) If you have answered "No"to question 17, why you do not discuss the risk factors of oral cancer with your patients? ☐

1. I do not have sufficient time
2. I am not trained enough to provide such advise
3. I think this would not be effective
4. Other (please explain): ……

19) How many patients have you referred to a specialist for suspected oral cancer lesion during the past year? ☐

1. None
2. 1 – 5
3. More than 5

20) If you have referred patients to a specialist for suspected oral cancer lesion during the past year, how did you refer your patient? ☐

1. Verbally told the patient to go to the specialist.
2. Sent the specialist a briefly written referral letter.
3. Sent the specialist a detailed written referral letter including a comprehensive description of the lesion.

21) Do you provide any educational material for patients regarding the risks of oral cancer in your clinic? ☐

1. Yes.
2. No.

Attitudes

22) Do you think that your knowledge on oral cancer is up-to-date? ☐

1. Yes
2. No
3. I do not know

23) Do you think you have sufficient knowledge concerning the prevention of oral cancer? ☐

1. Yes
2. No
3. I do not know

24) Do you think you have sufficient knowledge concerning the diagnosis of oral cancer? ☐

1. Yes
2. No
3. I do not know

25) Do you think that your under-graduate training in the diagnosis of oral cancer was adequate? ☐

1. Yes
2. No
3. I do not know

26) Do you think that screening for oral cancer through visual examination is an effective method for its early detection ☐

1. Yes
2. No
3. I do not know

27) Do you think that development of referral guidelines can improve the quality of referrals to specialists? ☐

1. Yes
2. No
3. I do not know

28) Would you like to get more information and continuing education regarding the examination and early detection of oral cancer? ☐

1. Yes
2. No

THANK YOU FOR YOUR TIME - IT IS MUCH APPRECIATED!

Appendix2: Informed consent

I am Dr. Nada Hassan Mohamed Ahmed, working at Oral Health Directorate, Ministry of Health, Khartoum State. I am presently a Master Degree student in Dental Public Health at University of the Western Cape, South Africa. I am carrying out research on Oral cancer Knowledge, attitudes and practices among dentists working in public dental clinics Khartoum State, Sudan.

Oral cancer is an important public health problem and I am carrying out this study to assess the level of the current dentists' knowledge, attitudes and practices of oral cancer in Khartoum State as a baseline data prior to conducting interventions designed to increase dentists' capacity to early detect and manage oral cancers and how they can provide counseling advice to their patients about risk reduction.

I would like to ask you a few questions and this will take about 15 minutes of your time. All information obtained will be treated with utmost confidentiality.

Your participation in this research is completely voluntary, you may decline to participate in the study or withdraw from the study at any time without giving any reason and this will have no adverse effects on you or your subsequent dental management nor any penalties.

If you need any further information regarding the study, please do not hesitate to contact me (Tel: 0912871917).

Thanking you in anticipation

Dr. Nada _____

I understand the information that has been provided to me and agree to participate in the study.

Name: …….. **Signature: …….**

Date: ……...

Name of Witness: ….…… **Signature: ……..**