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Oral cancer in the UK: to screen or not to screen

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Abstract

Although oral squamous cell carcinoma accounts for only a small proportion of malignant neoplasms in the UK, oral cancer incidence and mortality rates have been rising in recent years. The natural history of oral cancer is not adequately understood at present and there is very little information about the epidemiology of precancerous lesions in the UK. There are also insufficient data to provide firm evidence that the percentage of cases arising de novo is greater in the UK and the Western world as compared to the Indian subcontinent. Screening for oral cancer by visual examination is simple, inexpensive and causes little discomfort; however, there is no evidence for the effectiveness of screening for oral cancer either in reducing mortality from the disease or in reducing the incidence of invasive disease by detection and treatment of precancerous lesions. There is currently insufficient evidence to recommend population screening for oral cancer in the UK. Measures aimed at primary prevention of the disease may be a more feasible method of disease control at present.

Keywords: Mouth neoplasms; UK epidemiology; Precancerous conditions; Oral leukoplakia; Erythroplasia; Referral and consultation; Patient compliance; Mass screening; Sensitivity and specificity

1. Introduction

Oral cancer is one of the 10 most frequent cancers worldwide, with about three-quarters of all cases occurring in the developing countries [1]. In Central and Southeast Asia it accounts for up to 40% of all cancers, whereas in most industrialised countries it is relatively uncommon, accounting for less than 4% [2–4].

Oral cancers constitute only 1–4% of all malignant neoplasms in the UK [5], but the incidence and mortality are reported to have been rising in recent years. Although major advances in reconstructive surgery have improved the quality of life of patients, there have been no significant improvements in cure rates in the past few decades [6]. Other measures are, therefore, necessary to tackle the rising trends. Primary prevention using health education is one possibility; screening for oral cancer has also been suggested [7,8].

The potential benefits of screening are reduced mortality from oral cancer, reduced incidence of invasive oral cancer, reassurance for those screened negative and decreased costs of treatment as smaller lesions are easier to treat with less morbidity [7,9]. Any screening programme would also have disadvantages such as psychological trauma for false-positive cases, unnecessary treatment of precursor lesions which may never have progressed, false reassurance for false-negatives, and, not least, the financial costs of setting up the programme [7].

In 1993, a UK Working Group on Screening for Oral Cancer and Precancer concluded that there was insufficient evidence to recommend population-based screening. Opportunistic screening among high-risk groups attending primary care services was recommended [10]. In 1995, the European School of Oncology's Advisory Group on Oral Carcinogenesis to the European Commission for the Europe against Cancer Programme reported that there was no evidence to support population screening [11]. The Group also found it inadvisable to carry out randomised trials of oral cancer screening because of deficiencies in the knowledge of the natural history of oral cancer and the sensitivity and specificity of current screening tests. Other authors [12] have suggested a systematic reconsideration of data on the natural history of oral cancer from previous screening programmes and follow-up studies so as to design a trial evaluating the effectiveness of screening.

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Prior to considering the implementation of a screening programme for oral cancer as public health policy in the UK, it is necessary to examine whether the principles of screening are fulfilled [13–15] and whether sufficient research evidence exists for the beneficial effect of screening and for its cost-effectiveness when compared with other health interventions [16].

This paper discusses the present situation in the UK, with particular emphasis on the evidence for and against population-based screening for oral squamous cell carcinoma (ICD9 140, 141, 143–5).

2. Oral cancer in the UK

In England and Wales, the incidence of oral cancer is 4.0 per 100,000 per year at all ages, but over 30.0 per 100,000 among those aged 65 years or more [4]. Incidence and mortality rates have increased in young males during the last 30 years, a birth cohort effect being seen in those born after 1911–1912. Females show a similar trend though of a smaller magnitude; however, no cohort effect is apparent [17]. New registrations of oral cancer in 1991 (1815 in all) were 15.6% higher than the figure reported for 1971 [18]. In 1994, there were a total of 893 registered deaths due to oral cancer (ICD9 140, 141, 143–5) in England and Wales, of which 61% occurred in those aged 65 years or more [19].

In Scotland, among men aged 35–64, mouth cancer (ICD9 143–5) mortality rose from 0.5 per 100,000 in 1971–75 to 1.9 per 100,000 in 1985–1989, while in women the rate increased from 0.3 per 100,000 to 0.7 per 100,000. Incidence rates showed a similar trend. A cohort effect was seen for incidence and mortality due to tongue cancer among males born subsequent to 1910 [20,21].

A rising trend in oral cancer incidence has also been reported from Northern Ireland among both sexes though the magnitude is smaller among females [22,23].

A study conducted to determine the accuracy of oral cancer reporting found 27% under-ascertainment of cases at the Thames Cancer Registry and a similar figure at the South Western Cancer Registry. Warnakulasuriya et al. suggest that under ascertainment might be a national problem, the figures for oral cancer in the UK being actually much higher than reported [24].

The incidence of lip cancers has decreased over the last three decades among males. However, intra-oral cancer incidence, particularly that of the tongue and floor of the mouth, is rising in both sexes though the changes are less pronounced among females [18,21,25,26]. In 1991, tongue cancers (ICD9 141) accounted for about 40% of oral cancer registrations, mouth cancer (ICD9 143–5) for about 50%, and lip cancers (ICD9 140) the remaining 10% (Table 1).

Table 1
Oral cancer registrations in England and Wales (1991)

Site (ICD9)	Males		Females	
	Number	Rate[a]	Number	Rate[a]
Lip (140)	125	0.5	49	0.1
Tongue (141)	464	1.8	273	0.8
Alveolus (143)	71	0.3	52	0.1
Floor of the mouth (144)	246	1.0	81	0.3
Other and unspecified sites (145)	274	1.1	180	0.5

Source: Office for National Statistics (provisional data).

[a] Directly age standardised rates per 100,000 population using the European standard population.

Studies of oral cancer mortality according to ethnicity suggest substantially raised risks (RR = 2.2, 95% CI = 1.5–3.1 for males and RR = 5.5, 95% CI = 3.7–8.2 for females) among 'ethnic immigrants' from the Indian subcontinent as compared to the England and Wales 'native' population [27]. The incidence of oral cancer among 'Asians' in Bradford and Leicestershire has been reported to be higher than in 'non-Asians' [28,29].

To conclude, although the absolute number of oral cancer cases in the UK is small compared to cancers such as breast cancer and colorectal cancer, the incidence and mortality rates are rising and the number is, therefore, likely to increase in future. The total number of oral cancer deaths occurring each year is almost comparable to the number of deaths due to cervical cancer. However, oral cancer deaths occur among comparatively older age groups [30] and a national screening programme is operational for cervical cancer which will already be having an impact on mortality [31].

3. Natural history of oral squamous cell carcinoma

3.1. Risk factors

Both smoked [32–34] and smokeless tobacco [35,36] are aetiologically linked to oral cancer. Tobacco is also an important risk factor for pre-cancerous lesions of the mouth [37–40].

There is evidence that chewing betel quid with tobacco is carcinogenic to humans [35]. The habit of betel quid chewing is widespread in Southeast Asia, Eastern Melanesia, and the East African coast [41] and remains prevalent in South Asians who migrate to the UK [27,42], hence increasing the importance of betel quid as a risk factor in this country.

Elevated levels of alcohol consumption confer sizeable risks of developing oral cancer even after controlling for tobacco use [43–45].

Other aetiological factors such as diet [46,47], oral hygiene and dentition [48,49], mouthwashes [50,51] and

viral infections [52,53] have also been identified but their role is inconsistent.

Although tobacco and alcohol are known to be the major risk factors for oral cancer worldwide, data on risk factors for oral cancer in the UK are limited. La Vecchia et al. [54] suggest that alcohol and tobacco account for about 75% of oral cancers in Europe while dietary deficiencies or imbalances may account for about 10–15%.

A comprehensive discussion of the role of primary prevention in tackling the rising trends of oral cancer incidence and mortality is beyond the scope of this paper. However, it is fairly obvious that such activities should focus on health education to promote the cessation of tobacco use and moderation in alcohol consumption.

3.2. Precancerous lesions/conditions and malignant transformation

Both precursor lesions (leukoplakia, erythroplakia) and a number of pre-cancerous conditions (oral submucous fibrosis, lichen planus, syphilitic glossitis and sideropenic dysphagia) are known to exist.

Leukoplakia is the most common precancerous lesion [55]. The incidence and prevalence of oral leukoplakia in the UK are not known. However, outside the UK, the prevalence has been estimated to range from 0.2 to 11.7% [56]. The variation in prevalence between studies is likely to be due to varying methodology as well as population differences in risk factor prevalence. The minimum degree of whiteness required to define leukoplakia is arbitrary, and the lesions included in this group have differed between studies and over time [56–59]. The prevalence of leukoplakia was shown to vary between 0.7 and 24.8% in the same population just by altering the clinical criteria used [58]. In the only population-based prospective study (in Kerala, India), the age-adjusted annual incidence of oral leukoplakia among 20,358 villagers was reported to be 3.3/1000 among males and 1.9/1000 among females [60]. Leukoplakia is more common in males than in females and usually affects persons older than 40, the average age being 60 years [61–63].

The risk of malignant transformation is reported to vary with gender (higher among women), type of leukoplakia (higher among those that are idiopathic, non-homogenous, of a long duration, or situated on the tongue/floor of the mouth), presence of *Candida albicans*, and presence of epithelial dysplasia [55]. Hospital-based series from Europe and USA have reported malignant transformation rates of 4.4–17.5% for leukoplakia, whereas in India, population-based studies report rates of 0.13–2.2% (Table 2). Estimates of the percentage of leukoplakias which regress to normal vary between 4.6% per year in India to 28.6% in the USA. It is difficult to determine to what extent these differences are due to case selection, as opposed to variation in natural history.

The prevalence of erythroplakia is not known but it is less common than leukoplakia [64]. In a study of 64,354 cases of potential pre-malignant lesions in the USA, erythroplakias constituted only 0.09% of the total [65]. Erythroplakia has no apparent sex predilection and

Table 2
Malignant transformation and regression of leukoplakia

Reference	Setting		Number of cases	Follow-up	Transformation (%)	Regression (%)
[134]	California, USA	hospital	105	1–11 years	6.7	–
[135]	San Fancisco, USA	hospital leukoplakia patients	257	mean 7.2 years	17.5	28.6
[136]	Amsterdam	hospital leukoplakia patients	84 46 with available follow-up	1–8 years (mean 2.5)	3.6 (3/84) 6.5 (3/46)	–
[137]	Stockholm, Sweden	hospital	782	1–20 years	4.0	–
[138]	Copenhagen, Denmark	hospital	248	1–10 years (mean 3.7)	4.4	20.1
[139]	Budapest, Hungary	hospital	670	1–30 years (mean 9.8)	6	31
[140]	Oslo, Norway	hospital	157	6–16 years (mean 9.1)	8.9	–
[141]	Gujarat, India	industrial workers	4,762	2 years	0.13	31.6
[72]	Kerala, India Andhra Pradesh, India	field survey 1966–77	410 360	1–10 years (mean 7) 1–10 years (mean 7)	2.2 (4.4/1000 p.a.) 0.3	4.6 p.a.
[142]	Kerala, India	cohort of tobacco users baseline 1977–78	489 homogenous 13 nodular 105 ulcerated	median 4.8 years median 2.8 years median 4.4 years	1.3/1000 p.a. 162.2/1000 p.a. 2.2/1000 p.a.	

p.a., per annum.

is more common in the sixth and seventh decades of life [65,66]. There are no studies reporting follow-up of series of cases of erythroplakia, perhaps due to its relatively low prevalence or due to more active management. Most studies of biopsied cases of erythroplakia have found that the majority show areas of epithelial dysplasia, carcinoma in situ or invasive cancer [65,67], leading most authors to conclude that erythroplakia has a high potential for malignant transformation. However, the role of erythroplakia as a precursor lesion as opposed to an early sign of carcinoma in situ or invasive cancer is not clear.

Oral submucous fibrosis (OSMF) is a chronic disease of the oral mucosa which occurs predominantly among people of Indian origin and occasionally among other Asians. Sporadic cases have been reported among non-Asians (Europeans) [68,69]. The prevalence of OSMF in India ranges from 0.2 to 1.2% [70]. Evidence for the pre-cancerous nature of OSMF includes the observation of a higher prevalence of leukoplakia in cases of OSMF, the occurrence of epithelial dysplasia, the occurrence of OSMF in oral cancer patients and the higher incidence of oral cancer in patients with OSMF [70]. Data from India show increasing rates of malignant transformation with increasing duration of follow-up for OSMF (2–3% at 10 years of follow-up, 4.5% over 15 years, and 7.6% over a 17-year period).

Oral lichen planus (OLP) is a mucocutaneous disorder affecting 1–2% of the population in the UK [71]; similar figures have been reported in one study from India [72]. The malignant potential of OLP has been the subject of controversy for some time [73], the primary reasons being a debate over the diagnostic criteria and definition of OLP, the selection of patients included in follow-up studies and lack of information on the prevalence of OLP in the general population. Its role as a true precursor lesion remains unclear.

Other pre-cancerous conditions such as sideropenic dysphagia and tertiary syphilis are now rare in developed countries [74,75].

3.3. Cancers arising 'de novo'

The percentage of oral cancers which arise from precursor lesions is not accurately known, but has been estimated as more than 75% in India [76]. Although there are suggestions that the percentage of oral cancer cases arising de novo is greater in the Western world as compared to India [77], there are insufficient data to provide firm evidence particularly in countries such as the UK. Speight and Morgan [64] have calculated that, based on estimates of prevalence of leukoplakia and malignant transformation rates from the literature, progression of leukoplakias could account for the observed incidence of oral cancer in the UK.

4. Management

4.1. Potentially malignant oral lesions

To date, there are no widely accepted guidelines for the management of potentially malignant oral lesions in the UK [40,78,79] and available evidence confirms variability in the management of these lesions. Marley et al. [79] reports that only 6% of oral and maxillofacial surgeons had seen more than 100 patients with such lesions during the year of study (1993). This may reflect the referral of these patients to other specialties such as oral medicine clinics, ENT (ear, nose and throat) surgeons, plastic surgeons and radiotherapists or simply the low number of patients with pre-malignant oral lesions in the UK. Although the definitive diagnosis of potentially malignant lesions is based on histopathology [80,81], only 67% of the consultants biopsied the lesion routinely at initial presentation, the remaining 33% presumably relying on clinical appearance as a guide.

The malignant potential of leukoplakia appears to be associated with the presence of epithelial dysplasia which is graded by convention as mild, moderate or severe [82]. The clinical significance of mild and moderate epithelial dysplasia is not known but current evidence suggests that severe epithelial dysplasia has a high potential for future development of malignancy [83].

A management protocol for potentially malignant oral lesions proposed by Lamey [78] suggests the elimination of risk factors where possible, followed by a biopsy and surgical excision of lesions with severe dysplasia. For mild–moderately dysplastic lesions, a follow-up and re-biopsy is suggested after a 3-month period, with bleomycin or retinoid therapy if dysplasia is unchanged. A 6-monthly review is suggested for all patients for their entire life-time.

Most authors seem to agree on the initial approach suggested by Lamey but differ in their opinions on which lesions require surgical excision. Tradati et al. [84] suggest surgical excision of all persistent leukoplakias because of poor patient compliance with follow-up. Other authors [55] recommend active treatment for lesions showing moderate or severe dysplasia, with oral sub-site being the deciding factor in whether or not to treat mild dysplasia. In the UK, treatment of mild to moderate dysplasia varies, with 16% of oral and maxillofacial surgeons preferring no active treatment. For severe dysplasia and carcinoma in situ, the majority (96%) favoured excision; however, three (2%) of the clinicians reported not undertaking any active treatment for these lesions [79].

4.2. Chemoprevention

Retinoids [85–87], β-carotene [88], vitamin E [89] and *Spirulina fusiformis* [90] have been shown to produce regression of oral leukoplakia, but the lesions recur

soon after stopping the administration of the chemopreventive agents.

As no trial has evaluated primary outcome in terms of reduction in oral cancer incidence and mortality rates in apparently healthy subjects, it is at present premature to suggest chemoprevention as a routine strategy to prevent oral cancers.

4.3. Oral cancer

Treatment in the early stages of oral cancer is a choice between elective surgery and radical radiotherapy and depends on factors like the site of the tumour, stage, previous irradiation, histology and age of the patient. Preferences vary considerably between treatment centres, and partly reflect differences in resources, expertise, referral patterns and individual clinicians' opinions [11]. There is no evidence that survival of oral cancer patients can be improved by chemotherapy.

Formulation of national guidelines for the management of potentially malignant oral lesions and oral cancer, based on current knowledge, is essential to make the diagnosis and treatment of these lesions consistent across the UK.

5. Oral cancer prognosis

5.1. Predictors

Tumour stage is a significant predictor of survival, with prognosis worsening as stage increases [91–94]. Stage has also been found to be related to recurrence [94].

Several studies have reported an independent prognostic role for tumour diameter with treatment of lesions less than 2 cm in diameter resulting in a better prognosis than that of larger lesions [95–98].

Clinical involvement of neck nodes is also a good marker of prognosis: lymph node negative cases have a significantly better prognosis than cases with lymph node involvement [91,96,99,100]. Prognosis has also been reported to worsen as lymph node involvement progresses [95,98].

Duration of symptoms and clinical appearance of the tumour do not seem to have any prognostic significance when adjusted for other clinical factors [92,95]. Tumour site has been found to be an independent prognostic factor in some studies [93,96]. Lip cancers are reported to have the best prognosis with 5-year survival rates of 85–95% [101,102] whereas for tumours in the oral cavity 5-year survival rates vary from 25 to 60% [95].

Research into the role of histological factors, DNA ploidy, oncogene expression and other biological markers has shown that these may complement tumour stage as prognostic factors, but the results remain inconclusive at present. These investigations are also time consuming and require expensive equipment, thus limiting their clinical use as markers of prognosis. More prospective research is needed in order to establish the predictive value of such markers.

5.2. Diagnostic delay

Although the oral cavity permits easy access to visual examination, most carcinomas of the oral cavity are not diagnosed until they are symptomatic. By this time they are larger than 2 cm, regional spread to lymph nodes already having occurred in 50% of cases [103,104]. Several authors have reported a median total delay of approximately 4 months [104–108]. A study in the UK reported that patient delay in seeking professional advice was the most important factor delaying diagnosis [109]. Professional delay can result from failure on the part of the clinician to conduct a thorough examination, a low index of suspicion, and lack of experience with these tumours [104]. In the UK, a mean delay of 6.4 days from referral to histological diagnosis and 25.8 days from diagnosis to treatment has been reported [110]. One study [111] reported that general practitioners (GPs) diagnosed and referred oral cancer cases earlier than dental practitioners although the patient populations examined were similar. Another [109] found that dental practitioners were less likely than GPs to suggest a diagnosis of malignancy or to emphasise the urgency of the consultation in their referral letters to the specialist. These findings suggest an important role in the early diagnosis of oral cancer for GPs in the National Health Service as well as the need for continuing education among both groups of practitioners.

6. Screening for oral cancer

Screening for oral cancer and pre-cancer can be carried out by a systematic visual examination of the surface of the oral mucosa. The screening test is, therefore, relatively simple and inexpensive to perform, and causes little discomfort to the patient. A detailed examination protocol, including palpation for lymph nodes has been described [112] and palpation of the posterior third of the tongue has also been recommended [10]. The necessity for adequate lighting (standard dental lights) and the use of dental and laryngeal mirrors have been recognised [103].

6.1. Compliance

Pilot studies conducted within the UK have shown that the acceptance of an invitation to oral screening varies according to the setting.

A study carried out at a commercial organisation in London reported a 53% compliance among employees aged 40 and over, who were invited to attend for oral screening by a dentist on-site [113]. However, in a study of the feasibility of conducting oral screening as part of a routine dental check-up in a comparable setting to a NHS practice, almost all (1947/1949) subjects of any age registered with an industrial dental clinic who were invited to attend for an oral screen as part of their dental examination agreed to participate [114]. An invitational screening programme [115] targeting 4348 subjects (aged 40 and over) registered with an inner city medical practice in North London reported that 25.7% of those invited accepted; a further 8.5% responded after a second mailing. Of those screened, 12 patients (1.2%) tested positive, but only eight of these attended the referral appointment [115].

These results highlight the problem that, whilst the simplest way to organise screening in the UK may be to link examinations to dental check-ups, this may not reach the majority of the population at risk.

In the USA, a survey conducted in 1992 showed that 14.3% of respondents reported ever having an examination for oral cancer; of these more than half reported that their most recent examination was as part of a dental check-up, and more than a third said it was part of a routine physical examination [112].

Elsewhere, different strategies have been used to recruit subjects for oral cancer screening. A study in northeast Italy attempted to identify high-risk subjects (smokers and/or heavy drinkers) attending GP surgeries and offer them an examination for the early detection of head and neck cancer. Of 627 subjects identified over a 2-year period only 212 (34%) attended for examination [116].

In Tokoname, Japan, annual screening of 60-year-old residents for oral cancer and pre-cancer by postal invitation was begun in 1986 [117]. Of the 5187 individuals invited betweeen 1986 and 1983, only 802 (15.5%) attended. Among the variables studied, participation in screening for other diseases was most strongly associated with attendance.

6.2. Validity of the test

The sensitivity and specificity of screening depend on factors such as the training of the individual performing the examination, and on the criteria used to determine which lesions are counted as 'positive' and warrant referral for further investigation. The yield and positive predictive value depend on the population screened.

In the UK, examination of the oral cavity has been reported to have a sensitivity ranging from 71 to 81% and a specificity of 99% or more when screening was carried out by general dental practitioners, with dental specialists' diagnosis as the gold standard [113, 114,118]. In two studies [113,114], detection of a white or red patch or ulcer of more than 2 weeks duration constituted a positive test. The relatively low yield in one study [114] has been suggested to be due to the confidence of the screeners in diagnosing frictional keratosis (counted as a negative test). The fact that over half the subjects were below age 50 could also be a factor.

An attempt has been made to use computer-aided diagnosis, 'neural networking', to identify people at high risk of oral cancer [119]. Using data obtained on 10 risk factors, the 'network' correctly identified 80% of subjects diagnosed by specialists as having positive lesions, and had a specificity of 77%.

A number of authors have reported on the use of toluidine blue dye as an adjunct for screening for oral cancer in order to increase sensitivity by providing better demarcation of SCC and dysplastic changes [120]. A recent study in a clinical series found a sensitivity of 100% for oral cancer and 79.5% for oral epithelial dysplasia, but a specificity of only 62.5% [121]. A meta-analysis [122] of a number of clinical studies estimated the sensitivity of the test to range from 93.5 to 97.8%, and the specificity from 73.3 to 92.9%, but there are no studies of its use in a screening situation.

Table 3 summarises the results of the UK studies: specificity is high, sensitivity (where measurable) satisfactory, and values for the yield of positive lesions are generally high.

Table 3
Sensitivity and specificity of the screening test (UK studies)

Reference	Area/country	Settting	Subjects screened	Age	Sensitivity (%)	Specificity (%)	Yield (%)	PPV (%)
[113]	London	company dental practice	309	40+	71	99	5.5	86
[114]	Wirral	industrial dental clinic	1947	20–69	–	100	0.2	100
[118]	London	dental hospital (out-patients department)	1042	40+	81	99	3.1	68
		inner-city medical practice	985		64	99	2.2	47

PPV, positive predictive value.

6.3. Large-scale population screening studies

These have mostly been carried out outside the UK, in areas where oral cancer is a significant public health problem. In a number of studies in developing countries, a major problem with compliance has been with attendance for referral in those with a suspicious lesion.

The feasibility of using primary health care workers for oral cancer screening has been investigated in Sri Lanka [123]. Of 29,295 individuals (age > 20 years) screened, 1220 (4.2%) had oral lesions warranting referral [124]. However, only 660 (54.1%) of these subsequently attended re-evaluation by the project dentist and 384 (58%) had the diagnosis confirmed. Of a sample of 1212 subjects screened negative and re-examined, 21 (1.7%) were classified as positive. In another study in Sri Lanka [125], the use of a simultaneous health education programme improved compliance with referral to 62% (2193/3559). The detection rates were 35 per 100,000 for new oral cancers, and 30 per 1000 for a true positive referral. Of 1350 negative cases re-examined 3.8% had 'referable' lesions.

In Kerala, India, a sensitivity of 59% and a specificity of 98% have been reported for screening by Basic Health Workers and re-examination by dentists [126] . Of those referred, 72% had attended further examination, and 45% of these were deemed correctly referred. In another study in Kerala [127], despite organised training, only a small percentage of primary health workers were motivated to carry out screening. They examined 17,812 subjects (6.5% of those eligible) over a period of 36 months, but of the 408 referred with suspected lesions only 258 (63.2%) attended for re-examination. A population-based oral cancer screening trial aiming to randomise 90,000 individuals to intervention and control groups was begun in 1995 in Trivandrum, India. About 32,000 subjects have already been recruited, and a recent report indicates almost perfect agreement (kappa = 0.85) between health workers performing the oral screen and the reference findings provided by physicians, in the identification of various oral precancerous lesions [128].

In Cuba, an oral cancer screening programme has been in existence since 1984, with the aim of all subjects $\geqslant$15 years of age having an annual oral examination by a dentist [129]. Between 1984 and 1990, 12–26% of the population were covered annually, and of 30,244 (0.23%) individuals referred only 28.8% complied. The detection rate for cancers and pre-cancerous lesions was 0.3 per 1000 screens. A recent paper claims that a fall in the percentage of stage II–IV cancers between 1982 and 1988 reflects the effect of this program [130]. It is unlikely that treatment of pre-cancerous lesions would have a marked effect within such a time period. As no rates are presented, the percentages may simply reflect an increase in the diagnosis of early stage disease.

6.4. Mouth self-examination (MSE)

The majority of work on early detection of oral cancer has been on screening by health professionals. There is little information about the feasibility of self-screening, or on health education to promote this. One study which examined the feasibility of MSE in India reported that 36% of 22,000 eligible subjects approached had practised MSE [131]. Among 247 subjects visiting the clinic within 2 weeks of the promotion (distribution of brochures regarding MSE), seven new oral cancers and 82 pre-cancerous lesions/conditions were detected. However, there is no information on longer term uptake or detection rates.

6.5. Costs of screening

There are no estimates available of the full cost of a screening programme for oral cancer. Clearly the costs will vary according to the setting and method of organisation. The initial examination has been quoted as taking less than 5 min (e.g. of a dentist's time). However, it has been pointed out that the abolition of free dental check-ups in the UK means that the cost of screening in such a setting would, therefore, be borne by the population, and would have a detrimental effect on uptake [132].

Although facilities for the diagnosis and treatment of potentially malignant and malignant oral lesions exist, implementation of a population-based screening programme on a nationwide scale would be a strain on the available resources because of the resulting increase in work-load.

Preliminary results from a simulation model of population screening for oral cancer and precancer indicate that approximately 18,000 individuals would need to be screened in order to save one life [133]. With an assumed compliance rate of 50%, the net benefit of screening was the equivalent of 2.8 lives saved. However, any health gain achieved by screening would be severely compromised in the presence of low compliance rates, variable performance (detection rates) by practitioners, and high drop-out rates that might occur in a programme providing periodic rescreening.

7. Conclusions

Oral cancer incidence and mortality are currently rising; a cohort effect is seen for males born after 1911–12. Each year about 2000 new oral cancers (ICD9 140–145) and 1000 oral cancer deaths are registered in England and Wales. Although the major risk factors for oral

cancer are known to be tobacco and alcohol consumption, more information is needed on the risk factors for oral cancer in the UK, including those in ethnic groups, and on the reasons for the increasing incidence.

Visual examination appears to be a valid screening test for oral cancer and pre-cancer, the acceptability of screening varying according to the setting. There is a likelihood of selection bias, particularly if screening is performed in dental practices, with those attending likely to be a more health-conscious and low-risk population. In developing countries, whilst acceptance of initial examination has been good, compliance with referral by subjects detected positive has often been poor, and adequate resources may not be available for follow-up.

Incomplete understanding of the natural history of precursor lesions makes the classification of positive cases at screening difficult. Identification of all leukoplakias as 'positive' is likely to result in considerable over-diagnosis, but determination of which lesions are likely to progress involves invasive techniques. In addition, treatment of leukoplakia does not necessarily prevent progression to invasive cancer.

Further research into the natural history of the disease would be worthwhile in order to provide better estimates of the prevalence of pre-cancerous and early invasive lesions in Western countries. Whilst dentists may be the most appropriate professionals to conduct such studies, care needs to be taken to avoid a highly selected population.

As there are no widely accepted guidelines for the management of potentially malignant oral lesions in the UK and available evidence confirms variability in the management of these lesions by consultant oral and maxillofacial surgeons, formulation of national guidelines based on current knowledge is essential to make the diagnosis and treatment of these lesions consistent across the UK.

Although treatment of early invasive cancer will cause less morbidity than that of late-stage cancer, and early stage disease has a better prognosis, there is no evidence on the effectiveness of population screening for oral cancer, either in reducing mortality from the disease or in reducing the incidence of invasive disease by the detection and treatment of precursor lesions. On the same basis, there is no justification for opportunistic screening in general practitioner/dental practitioner clinics. In addition, this method might not reach individuals at high risk of disease, as clinic attendees are often more health conscious, low-risk individuals.

Further research on the effectiveness of screening for oral cancer, ideally in the form of a randomised trial is, therefore, necessary before population screening is considered. The applicability of the results of the on-going Indian trial [28] to the UK are likely to be limited, both due to methods of intervention and possible differences in natural history. A randomised trial in the general population in the UK would be prohibitively large with an estimated sample size in excess of 1.4 million subjects based on current oral cancer mortality rates among the general population ($\alpha = 0.05$, 80% power to detect a mortality reduction of 20%). Calculation of sample size using expected mortality rates among a population initially free of disease (as in a screening trial setting) would yield an even higher figure. Although this problem could be overcome by targeting a sub-group at sufficiently increased risk of oral cancer, identification of such a group (smokers and drinkers aged 40+ years) would be a difficult task as lifestyle factors are often difficult to ascertain and people are reluctant to admit to them [7].

There is currently insufficient evidence to recommend population screening for oral cancer in the UK. Other measures, particularly efforts aimed at primary prevention of the disease may be a more feasible method of disease control at present.

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