J Oral Pathol Med (2004) 33: 253–9

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# Prevalence of oral mucosal lesions in alcohol misusers in south London

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**BACKGROUND: Information on alcohol-associated oral mucosal lesions (OMLs) and conditions is meagre. A prevalence survey among alcohol misusers in south London was therefore undertaken.**

**METHODS: Six hundred and ninety-three subjects (388 alcohol misusers and 305 alcohol + substance abuse) attending several clinical care facilities in south London between 1994 and 1999 were interviewed on their alcohol and drug habits. A comprehensive oral mucosal examination was performed, and soft tissue lesions found were classified by the clinical criteria of Axéll.**

**RESULTS: Mean age of the sample was 40.5 years. The majority was white (92.6%); of the whites, 29.9% were Celts (i.e. Irish, Scots resident in London). Many subjects reported misusing more than one type of beverage. Two hundred and twenty-seven OMLs were found in 195 subjects (28.1%). The highest prevalences were found for frictional keratosis (8.8%), scar tissue of the lips (4.8%) and candidiasis (3.8%). Angular cheilitis was present in 21 subjects (3.0%). The alcohol-related OMLs detected were three white patches compatible with a diagnosis of leukoplakia and one treated oral carcinoma. No erythroplakias were detected. The differences in prevalence of mucosal lesions in the two groups were not significant ($\chi^2 = 2.18$; $P = 0.14$). The prevalence of tobacco smoking was high in both study groups. OMLs were found with all four types of beverages consumed, and there was little variation by the units per week consumed. Concurrent use of substances and alcohol did not make a significant difference to the prevalence of OML. In the logistic regression analysis, minority ethnic groups (Black or Asian), smokers, those with a body mass index (BMI) under 20 and beer drinkers had an increased risk of an OML in this group of alcohol misusers.**

**CONCLUSIONS: In comparison with previous oral mucosal screening programmes undertaken in several settings in the UK, the present study has yielded a higher prevalence of oral mucosal diseases and conditions in this risk population. There are several ways in which alcohol could contribute to these detected oral lesions, either directly or indirectly.**

*J Oral Pathol Med* (2004) **33**: 253–9

**Keywords:** alcohol; cancer; oral cavity; oral mucosal lesions; precancer; substances

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Accepted for publication October 21, 2003

## Introduction

In the UK population of 55 million, over three-quarters of a million are dependent alcoholics. While there are many indicators of alcoholism evident in the medical history and on general systemic examination of subjects misusing alcohol, evidence of a relationship between oral mucosal health/disease and alcoholism, however, is not clearly defined. Alcohol misuse is a significant aetiological factor for oral and oropharyngeal cancer in the UK (1, 2). Several epidemiological studies related to oral mucosal conditions and diseases have been reported within the UK. These have been largely invitational screening programmes in medical or dental practices (3, 4) or were based on screening at industrial locations (5–8). None have examined a high-risk population who might be likely to have a compromised oral health. The objective of this study was to record the prevalence of oral mucosal conditions and diseases among alcohol and other substance misusers attending various treatment facilities.

## Materials and methods

The study group comprised of persons attending following statutory and voluntary sector clinical care facilities in South-east London, a deprived inner city population, between 1994 and 1999: a weekly out-patients' alcohol

intervention clinic at King's College Hospital, detoxification units at the Maudsley Hospital and at the Royal Bethlem Hospital, Beckenham, Kent, the community drink/drug project unit, a voluntary sector rehabilitation centre at St Luke's Mission, the Drink Crisis Centre and several local half-way housing units for chronic alcoholics. The study protocol was approved by the King's Healthcare NHS Trust, Research Ethics Committee. Each volunteer was given an information sheet and a verbal explanation before being asked for written consent to participate in the study. All of the above-mentioned clinical care facilities were visited monthly/bimonthly, subject to their availability. All newly admitted subjects in residence or in attendance on the day of the visit were approached and invited to a dental and oral examination except in situations where a Nurse Manager thought the person was too ill or would be unfit for an interview.

A pre-tested questionnaire was used to record the alcohol beverage type used, its frequency and duration of use; smoking habits and standard demographic data including ethnicity. Any drug misuse, its duration and the type of drug employed were also recorded. Any prescribed or self-administered medication for the patient was also recorded. A single examiner (C.K.H.) applied the questionnaires at interview. The questionnaire was pilot tested by Harris et al. (9). The sample for the pilot included 107 subjects drawn from three of the centres listed earlier. The subjects included in the pilot study were not included in this study. Some questions were modified.

From the recorded weight and height, the body mass index (BMI) was calculated (BMI = weight (kg)/height ($m^2$)).

A comprehensive oral mucosal examination was performed on each subject using two mouth mirrors for retraction of soft tissues**.** A sterile piece of gauze was used to retract the tongue during this examination. All examinations were carried out under field conditions.

The King's Dental Institute infection control guidelines were used throughout the field study. All instruments used for mouth examinations were obtained from the Institute's Central Sterilisation Department. No facilities existed for participants to rinse their mouths before or after the oral examination. The latter lasted approximately 5 min out of the three-quarters of an hour spent with each subject collecting data.

Soft-tissue lesions were recorded as present or absent classified into groups based on clinical criteria earlier devised by Axéll (10). The inclusion and exclusion criteria derived specifically for the study are available from the authors on request. Confirmation of clinical findings by biopsy was not possible for all cases. Any mucosal lesion found was recorded but those of specific concern were leukoplakia and smoker's palate, erythroplakia and oral cancer.

The examiner (C.K.H.), an experienced clinical dentist, received training on the detection of mucosal lesions, premalignant and malignant and other benign mucosal lesions, their sites to be encountered and clinical appearances that might be expected, by means of a slide presentation by one of the senior authors (S.W.) calibrated to WHO criteria for detection of oral mucosal lesions (OMLs). Further training was from a WHO-accredited reference manual (11).

Any abnormal findings and treatments required were reported to the patient on examination, the head of the unit at the institution where the patient was seen and to the patient's General Practitioner (GP) and General Dental Practitioner (GDP).

Data collected were entered through the SPSS (release 10), and frequency tables and cross-tabulation were performed. $\chi^2$-test was used to compare differences between groups and *t*-test to compare means where quantitative data were available.

## Results

The number of subjects seen was 693. There were 537 males and 156 females. Their ages ranged from 19 to 79 years (mean age $40.5 \pm 9.6$ years). The majority of the population was white (92.6%). Of the whites, 29.9% were Celts: Scots or Irish. Of the remaining 51 subjects, 29 were Black and 22 were Asian.

Based on habits reported, 388 (56%) were solely alcohol misusers, and 305 (44%) subjects reported combined alcohol misuse and substance abuse. No significant gender differences were noted between the two groups ($\chi^2 = 2.06$; $P = 0.15$).

Of the total group, 19.8% were undernourished (BMI less than 20); 18.6% in the alcohol-only group, 21.3% in the alcohol and substance group and the proportions undernourished in the two groups were not significantly different ($\chi^2 = 0.65$; $P = 0.42$)

The choice of alcoholic beverage consumed by the two groups is shown in Fig. 1. Many subjects reported misusing more than one type of beverage. When individual beverages were considered by gender, beer alone was consumed by 76% of men compared with 59% of women ($\chi^2 = 16.6$; $P < 0.001$); cider by 22% of men and 15% of women ($\chi^2 = 2.524$; $P = 0.11$). Significantly more women consumed wine (21% vs. 11%; $\chi^2 = 10.0$; $P = 0.002$) and spirits (55.1% vs. 44.7%; $\chi^2 = 4.87$; $P = 0.03$). The number of units of alcohol consumed per week by alcohol misuser groups is shown in Fig. 2. The average male consumption was 277 units per week and in females it was 232.

One hundred and ninety-five subjects were detected with OMLs (28.1%). Slightly more subjects had mucosal lesions in the alcohol and substance group (31.1%) than in the alcohol-only (25.8%) group. These differences in prevalence of mucosal lesions in the two groups were not significant ($\chi^2 = 2.18$; $P = 0.14$)

One hundred and sixty-eight subjects (24.1%) had a single lesion, 22 (3.2%) had two and 5 (0.7%) had three lesions. The presence of a single lesion compared with multiple lesions in an individual subject was not significantly different in the two study groups ($\chi^2 = 0.471$; $P = 0.493$). The various mucosal lesions detected are listed in Table 1. The highest prevalences were found for frictional keratosis (8.8%), scar tissue of the lips (4.8%) and candidiasis (3.9%); angular cheilitis was present in 21 subjects (3.0%). One subject who had previously received treatment for oral cancer presented at one of the treatment centres. The alcohol-related OML detected were three white patches compatible with a diagnosis of leukoplakia and one treated oral carcinoma. No erythroplakias were detected.

In the edentulous category, there were 30 subjects and among them 13 had mucosal lesions. The subject who had been treated for oral cancer was also edentulous.

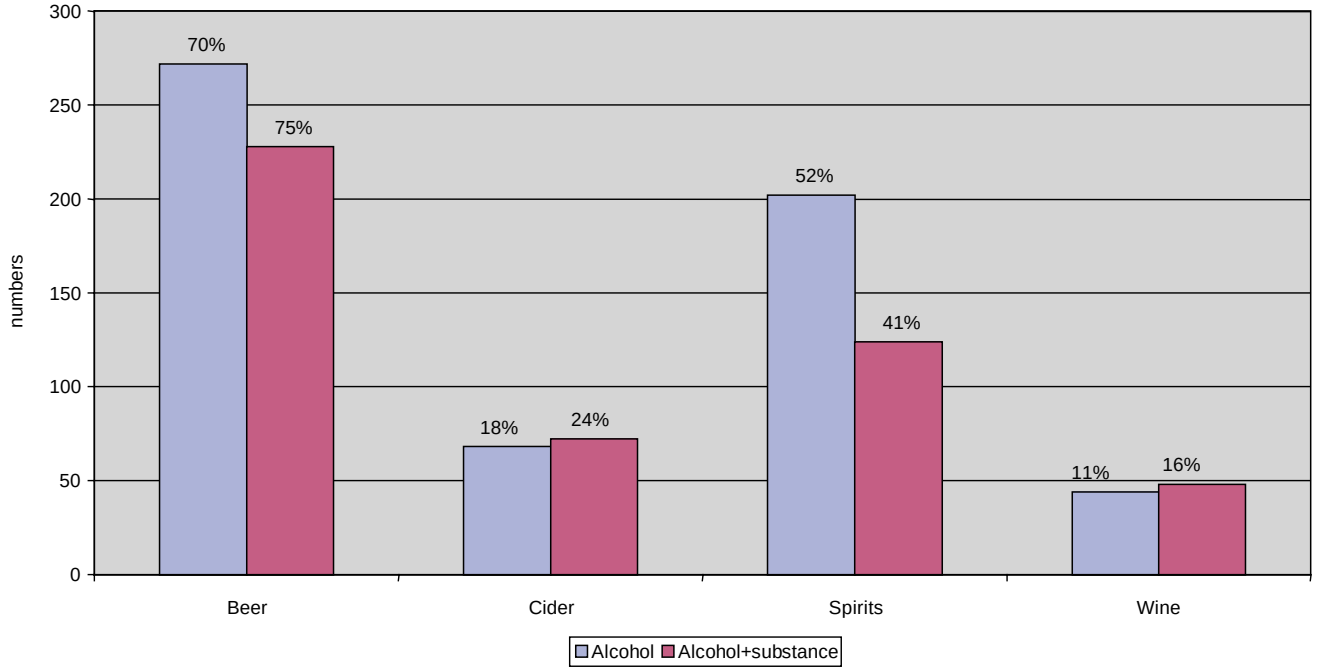
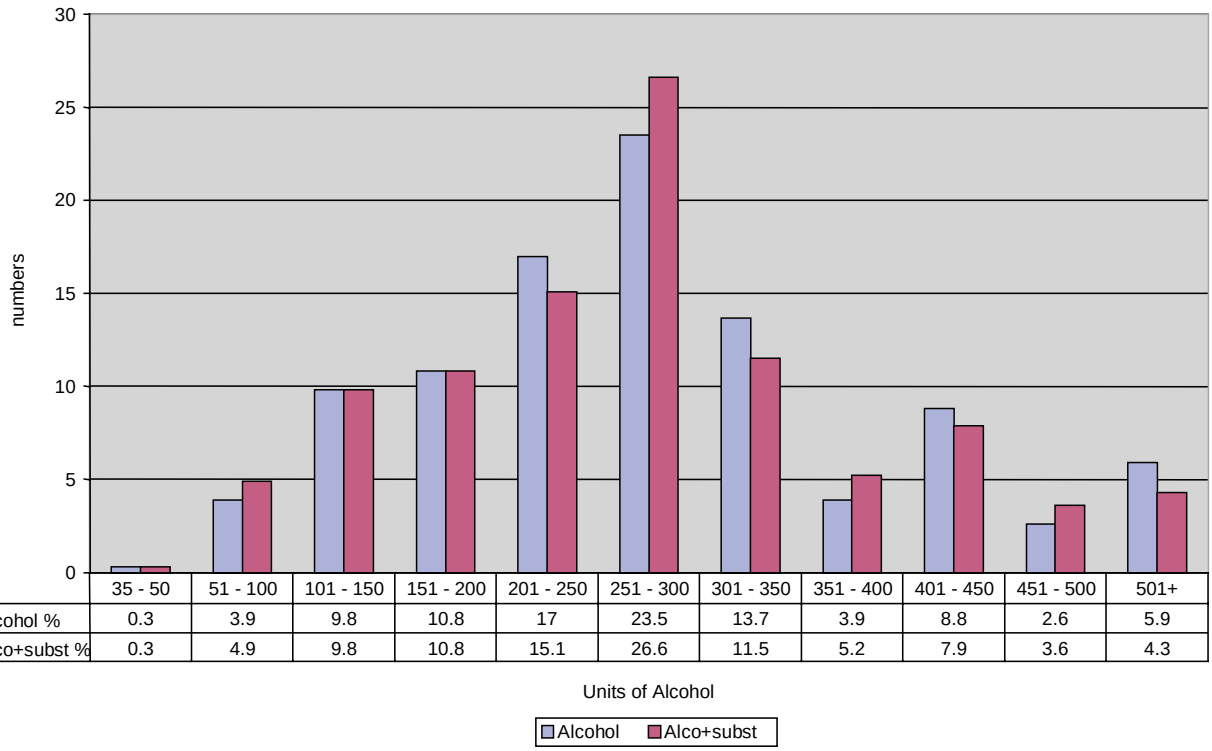



**Figure 1** Type of alcoholic beverage consumed by the alcoholic groups.

No trends were apparent in the distribution of oral lesions by age (45 years and under or 45+ years;. $\chi^2 = 1.01$; $P = 0.32$). There was no significant gender differences in the prevalence of mucosal lesions (males 28.5%; females 26.9%: $\chi^2 = 0.8$; $P = 0.78$). There were, however, significant ethnic differences in the prevalence of lesions, with a high proportion of Blacks (55%) and Asians (41%) having mucosal lesions compared with whites ($\chi^2 = 13.13$; df = 2; $P = 0.001$).

The prevalence of tobacco smoking was high in both study groups: among the alcohol-only sample 330/388 (85%) and in the alcohol and substance group 290/305 (95%) smoked (Table 2). We noted a significant difference




| | 35 - 50 | 51 - 100 | 101 - 150 | 151 - 200 | 201 - 250 | 251 - 300 | 301 - 350 | 351 - 400 | 401 - 450 | 451 - 500 | 501+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alcohol % | 0.3 | 3.9 | 9.8 | 10.8 | 17 | 23.5 | 13.7 | 3.9 | 8.8 | 2.6 | 5.9 |
| Alco+subst % | 0.3 | 4.9 | 9.8 | 10.8 | 15.1 | 26.6 | 11.5 | 5.2 | 7.9 | 3.6 | 4.3 |

**Figure 2** Alcohol consumption by the two groups.

**Table 1** The distribution of OMLs in alcohol and substance misusers

| *Type of lesion* | *Alcohol* | *Alcohol + substance* |
|---|---|---|
| Lip scar tissue | 17 | 16 |
| Herpes labialis | 4 | 4 |
| Angular cheilitis | 10 | 11 |
| Candidiasis | 15 | 12 |
| Glossitis | 5 | 7 |
| Geographical tongue/fissured tongue | 1 | 3 |
| Ulcers – traumatic, aphthous | 14 | 1 |
| Lumps – granulomas, fibromas, papillomas | 5 | 2 |
| Pericoronitis | 2 | 15 |
| Lichen planus | 3 | 1 |
| Frictional keratosis | 34 | 27 |
| Leukoplakia including smoker's palate | 10 | 7 |
| Erythroplakia | 0 | 0 |
| Oral carcinoma (treated) | 0 | 1 |
| Total lesions | 120 | 107 |
| Prevalence of lesions (%) | 31.0 | 35.1 |
| Number of subjects with lesions | 100/388 | 95/305 |
| Percentage of subjects with lesions | 25.8 | 31.1 |

**Table 2** OMLs: association with smoking in the two study groups

| | *Alcohol* | | *Alcohol + substances* | |
|---|---|---|---|---|
| *Smoking status* | *No.* | *%* | *No.* | *%* |
| ≤10 per day and ≤20 years | 14 | 15 | 14 | 15 |
| ≤10 per day and >20 years | 2 | 2 | 3 | 3 |
| >10 per day and ≤20 years | 51 | 51 | 40 | 42 |
| >10 per day and >20 years | 33 | 33 | 38 | 40 |

between the prevalence of lesions in the smokers and the non-smokers ($\chi^2 = 4.012$; $P = 0.045$). There was a trend for the increased frequency of smoking (11+ per day) to be more influencing lesion prevalence than the duration of smoking.

There was no relationship between the presence or absence of a lesion and the number of units of alcohol consumed in either group (alcohol group, $t = 0.41$; $P = 0.68$: alcohol and substance group, $t = 0.5$; $P = 0.62$).

Oral mucosal lesions were found with all four types of beverages consumed, but frequently, the subjects were drinking a cocktail of drinks. The risks from drinking beer were slightly greater than those for other alcoholic beverages and, in the univariate analysis, approached statistical significance ($\chi^2 = 3.69$; $P = 0.055$) (Table 3).

Most subjects frequently misused more than one substance. Thus, the significance of a particular substance misused to an OML is not clear. Concurrent use of substances and alcohol did not make a significant difference to the prevalence of OML (data not shown).

**Table 4** Predictors of OMLs: logistic regression analysis

| *Independent variable* | *Odds ratio* | *95%CI* | *P-value* |
|---|---|---|---|
| Ethnicity (non-white) | 2.599 | 1.449–4.661 | 0.001 |
| Smoker | 1.977 | 1.045–3.74 | 0.036 |
| BMI < 20 | 1.649 | 1.104–2.463 | 0.015 |
| Beer drinker | 1.509 | 1.044–2.180 | 0.028 |

There were 61 (8.8%) cases detected with frictional keratosis. It was the most prevalent lesion diagnosed in this study. The alcohol group had 34 lesions and cases with frictional keratosis. Lip scarring was found in 33 subjects (4.8%), the second most prevalent soft tissue lesion seen in this study group. Seventeen were in the alcohol-only group, and 16 in the alcohol and substance misusers. There were 27 *Candida*-associated lesions (3.8% in the whole group, of which 15 were in the alcohol group and 12 were in the alcohol and substance group). Angular cheilitis was present in 21 subjects (3.0%). All were found in White subjects. Ten subjects were in the alcohol-only group, and 11 in the alcohol and substance group.

Only four (0.6%) cases of lichen planus were found; all were of the reticular type.

The 17 lesions of keratoses (excluding those of frictional origin) comprised 14 smoker's palates and three cases of leukoplakia. In the total sample, the prevalence of leukoplakia and smoker's palate was 2.5%. The gender ratio (F:M) was 1 : 5, 1.6% (3/191) of females and 2.4% (14/579) of males with lesions. These lesions were present in 1.9% (14/719) of whites, 8.0% of Asians and 2.7% (1/36) of Blacks.

No new oral cancers were diagnosed during examination of the whole sample. One subject who previously had been diagnosed and treated for a recurrence of oral cancer, but was now disease-free was examined. This was a White male 56-year-old manual worker who was well nourished but drinking up to 100 units per week at the time of this examination and was undergoing alcohol intervention counselling. The subject drank spirits only, had smoked heavily 21+ cigarettes per day for more than 21+ years and misused cannabis and hemineverin, a drug previously used in alcohol-withdrawal treatment.

Table 4 summarises predictors of a mucosal lesion (both groups combined) in this study sample. Minority ethnic groups (Black or Asian), smokers, those with a BMI under 20, and beer drinkers had an increased risk to present with an

**Table 3** The prevalence of OMLs and type of alcoholic beverage consumed

| | *Alcohol-only (n = 388)* | | | *Alcohol + substance group (n = 305)* | | |
|---|---|---|---|---|---|---|
| *Beverage* | *OML+* | *Drinkers* | *%* | *OML+* | *Drinkers* | *%* |
| Beer | 36 | 116 | 31 | 29 | 77 | 38 |
| Cider | 19 | 68 | 28 | 24 | 72 | 33 |
| Spirits | 53 | 202 | 26 | 39 | 124 | 32 |
| Wine | 11 | 44 | 25 | 10 | 48 | 21 |

OMLs detected = OML+.

OML. Among the independent variables studied ,predictors of cancer or pre-cancer were only age of the patient (OR = 1.08; 95% CI: 1.031, 1.132) and unemployment (OR = 4.09; 95% CI: 1.063, 15.789).

## Discussion

Oral mucosal conditions and diseases may be caused by local disease (bacterial and viral), systemic disease (e.g. metabolic, immunological), as reactions to drugs or may relate to life-style factors such as consumption of tobacco, betel quid or alcohol. While tobacco and betel quid-associated OMLs have been widely researched and described (12, 13), the effects of alcohol have not been examined in population studies. The subjects studied here were all high-risk, being very heavy tobacco and substance misusers. They were seen in either hospital/detoxification units/recovery programme situations. In our preliminary study (9), the validity of answers to questions on weekly drinking patterns was verified using the AUDIT questionnaire and there was no reason to believe that the subjects in the study under- or over-estimated hazardous or harmful drinking.

The methods of recording of oral mucosal diseases vary. Most population-based surveys of OML report findings related to oral cancer and pre-cancer. Few authors have recorded overall findings related to any mucosal abnormality. For example, Axéll (10, 14) reported 60 different OML from his survey of a Swedish population. Field et al. (7) also reported all pre-malignant and benign lesions found on screening, and nearly 50% of reported lesions were frictional keratosis. Others reported on few types of lesions (15). Recording all OMLs detected at the examination clearly results in a high prevalence. Downer et al. (6) screening in a company headquarter and Jullien et al. (3) in a medical practice used the same diagnostic categories as Field et al. (7), but reported only mucosal lesions considered pre-cancer and cancer. The prevalence was in the range of 0.2–5.5% for these selected categories. Of the screening programmes reported so far, only one of these UK studies detected two cancers during screening (4) and one other study referred a suspicion lesion marked ulcer/erythroplakia that was subsequently diagnosed as a carcinoma (7); the pre-cancers found were also meagre (Table 5). There has been no national population prevalence study in the UK with which to compare the current data. While five out of six reported UK studies included volunteer subjects from a given population, the issue of screening high-risk subjects has received limited attention.

In this survey, the prevalence of OML was high (28%). Some, but not all, of these lesions could be explained by risk factors for this population. For example, high prevalence of lip scars (4.8%) was found to be related to violence associated with alcoholism. The previously reported prevalence of OML in alcohol misusers and substance users is virtually unknown, and therefore any comparison has to be made with investigations reported on general populations. It is also difficult to compare the prevalence of OML in different studies because of different methodology, selection of subjects, criteria used for a positive screen, examination procedure and biopsy rate of detected lesions.

It is important that studies of this nature are feasible, valid and reliable. However, not all people reported here were amenable to detailed examinations or questioning. As a result, oral examinations were brief and undertaken in their natural settings. Some sites of the oral cavity are easily missed, and therefore under-registrations can occur in field examinations. The examiner was calibrated for systematic screening and for the detection of OML. It was possible to separate normal healthy mucosae from any alteration in colour or consistency of the lining mucosa, which were then characterised on their clinical presentation. It was regarded impractical to recall any of the subjects to the examination centres for the sole purpose of re-examination to assess intra-examiner variability. This was because of the short duration of stay of many subjects in the centres, lack of a permanent address of residence and the fact that many subjects were subsequently re-located. Referral of all positive detections to an assessment centre would have allowed an estimation of false-positives registrations, but this was considered impractical with the alcohol-misusing subjects enlisted in this study. Therefore, the diagnosis given by the examining dentist was taken as the gold standard for reporting the results of mucosal examinations undertaken. Any potentially malignant lesion or a lesion suspicious of cancer was referred through their general practitioners for further assessments and treatment.

Selective screening of high-risk groups (e.g. tobacco users, excess alcohol consumers, ethnic minorities, the elderly) can be potentially beneficial as those individuals with the greatest need may have less opportunities to be

**Table 5** Reported UK population studies[a] on screening for OMLs

| *Study author, year and reference (Reference number)* | *Examined (No.)* | *Cancers (No.)* | *Pre-cancer* | | *Benign lesions* | | *Total detected* | |
|---|---|---|---|---|---|---|---|---|
| | | | *No.* | *%* | *No.* | *%* | *No.* | *%* |
| Jullien et al., 1995 (3) | 985 | 0 | 12 | 1.2 | 11[b] | 1.1 | 23 | 2.3 |
| Downer et al., 1995 (6)[c] | 553 | 0 | 17 | 5.5 | – | – | 17 | 5.5 |
| Field et al., 1995 (7) | 1947 | 1 | 3 | 0.2 | 151 | 7.8 | 155 | 8.0 |
| Desmond et al., 1996 (21) | 4073 | 0 | 205 | 5.0 | 842 | 20.6 | 1047 | 25.7 |
| Feaver, 1997 (5)[c] | 11970 | 0 | 64 | 0.5 | – | – | 64 | 0.5 |
| Lim et al., 2003 (4) | 2265 | 2 | 92 | 4.2 | 225 | 9.9 | 319 | 14.1 |

[a]The list excludes studies carried out on ethnic minorities or reporting hospital samples.
[b]Excluding one non-mucosal lesion reported by authors.
[c]Only those positive with a white/red patch (pre-cancer) or ulcer greater than 2 weeks' duration were reported.

picked up because of irregular dental attendance for dental examinations (16, 17). Targeting those at risk can give a higher yield of positive detections associated with tobacco and alcohol misuse (18).

The present study undertaken in a high-risk population setting can be compared with the few other recently reported studies from other countries that have utilised selected populations. Talamini et al. (19) reported a screening programme in northern Italy where oral and ENT examinations were carried out on heavy tobacco and alcohol consumers. Among 212 subjects examined, 5 cancers and 15 pre-cancers were detected, a very high yield compared with other reported screening programmes involving the general population at large. Their sample was heavily male dominated (87%) with 82% of the sample being over 45 years of age. They reported that smokers were reluctant to be screened whereas alcohol drinkers were happy to attend. The prevalence of cancer found by Talamini et al. (19) was substantial (2.4%). It reflects a range of anatomical sites examined by ENT surgeons that included the oesophagus, pharynx and larynx outside the oral cavity. A similar approach for screening of known heavy alcohol misusers was reported by Vacher et al. (20) in a French study. They found 2 cancers and 23 leukoplakias among the small sample of 270 high-risk subjects. From the point of view of screen detections, there appears to be a valuable cost benefit in these studies.

Another approach to high-risk screening was an oral screening of 4000 elderly people conducted during the 'Oral Health Week 1994' in 100 Age Concern day care centres by volunteer dentists. They were screened in a relatively unstructured setting. Although the yield of OML reported was high (25.7%), no cancers were found. Desmond et al. (21) considered that about 5% had pre-cancerous lesions. However, among those referred for a specialist opinion an unacceptably high level of false positives were recorded.

Leukoplakia is diagnosed by ruling out other white lesions and is mostly caused by tobacco or could be idiopathic (14). In the United States, Bouquot (22) considered it affects about 3% of the White population. He states that leukoplakia is the most common of all chronic oral mucosal diseases, with 80% of lesions occurring in smokers and being more common in older males. In the current study, all of the leukoplakia lesions recorded were in males and smokers. Axéll (14), in Sweden, found leukoplakia in 3.6% of cases; Reichart and Kohn (23), in Berlin, found that 0.9% showed oral leukoplakia and 0.1% smoker's palate; Banoczy's group (24) from Hungary reported 3.3% with oral leukoplakia. Field et al. (7), in an industrial setting in the UK, reported for oral leukoplakia a lower prevalence of 0.2%. The prevalence of leukoplakia found in this high-risk sample was 0.6%, which is low compared with reported values in other studies. It therefore appears that alcohol misuse itself does not contribute significantly to an increased susceptibility to oral leukoplakia in this White population. An Indian study reported a significant association of alcohol drinking for this condition, but this was possibly confounded by use of chewing tobacco in that population (25).

Alcohol is also known to have multiplicative effects with smoking on the risks of cancer in the oral cavity, pharynx and the upper digestive tract (26–29). How alcohol misuse may result in an increased risk and several mechanisms involved have been discussed by other authors (30). Recently, it has been claimed that alcohol consumption may be more important in the aetiology of intra-oral cancer than cigarette smoking (31). Long-term cancer risks among alcoholics are well recognised (32). IARC in 1988 concluded that the occurrence of malignant tumours of the oral cavity, oro- and hypo-pharynx, upper larynx, oesophagus and liver is causally related to consumption of alcoholic beverages (33). Dose–response shows there is a continuous risk curve (33) and the risk is formally significant for those consuming over 40 g alcohol per day (34).

Possible mechanisms of alcohol-related toxicity and injury to various tissues include pre-dominant pro-oxidant effects and enhanced lipid peroxidation (35). Mucosal atrophy (36) and an increase in permeability of human oral mucosa (37) are reported. These will influence the permeation of putative antigens as well as other carcinogens across oral mucosa.

Deeham et al. (38) in a review concluded 'the medical profession has a basic lack of knowledge about the fundamentals of alcohol misuse, avoids working with ''alcoholics'' and has little faith in its own abilities to detect and treat the problem.' Among dentists practising in the UK, only 19% are reported to be making regular inquiry into alcohol use (39) and this raises the need for continued professional development on these life-style-related issues. This study on prevalence of OMLs in a group of alcohol and substance misusers highlights a group of patients in whom special care is required when examining the soft tissues of the mouth.

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