

# Maryland Dental Hygienists' Assessment of Patients' Risk Behaviors for Oral Cancer

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## Introduction

Oral cancers (of the lip, tongue, mouth, and pharynx) account for nearly 3% of the approximately one million new cases of invasive cancer occurring each year in the United States and are responsible for more than 8,000 deaths each year.<sup>1,3</sup> Half of all oral and pharyngeal cancers diagnosed in the United States have already metastasized to the lymph nodes.<sup>4</sup> The five-year survival rate (52%) for all stages of oral cancer is poor.<sup>2</sup> Maryland ranks 13th among all states for estimated new oral cancer cases.<sup>2</sup> The mortality rate is the sixth highest overall and one of the highest in the nation for African-American males.<sup>5</sup> Failure to identify individuals at higher risk and failure to focus attention on sites within the oral cavity that are at greater risk for oral cancer, likely contributes significantly to late-stage diagnosis and, subsequently, poor survival rates.

Much misinformation exists regarding risk fac-

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## Abstract

**Purpose.** This study examined Maryland dental hygienists' knowledge of tobacco and alcohol use as oral cancer risk behaviors; the practice of obtaining comprehensive medical histories regarding patients' current, past, and type/amount of alcohol and tobacco used; and their opinions about the adequacy of their tobacco and alcohol cessation educational preparation in a state that ranks unusually high for oral cancer mortality rates.

**Methods.** The data source was the Maryland Oral Cancer Survey of Dental Hygienists conducted in November 1997 (MDOCSDH, 1997) with a simple random sample of 700 dental hygienists selected from a registry of 2,677 licensed dental hygienists in Maryland. Data were collected with a 40-item self-administered mailed questionnaire. Unweighted data from 331 returned surveys (response rate = 60%) were analyzed using SAS and SUDAAN Software. Stratified and logistic data analysis techniques were utilized, and the results were evaluated statistically using a .05 level of significance.

**Results.** Nearly all of the responding dental hygienists knew that tobacco is an oral cancer risk factor. Most probed their patients' present use of tobacco in medical histories; however, fewer assessed patients' past use and type/amount of tobacco used. Very few believed that they were adequately prepared to provide tobacco cessation education, although the majority agreed that dental hygienists should be prepared to provide this type of information.

The majority of respondents also knew that alcohol use is an oral cancer risk factor; however, less probed their patients' present use of alcohol in medical histories compared to assessing present tobacco use. Even fewer assessed patients' past use and type/amount of alcohol used. A very small minority believed that they were adequately prepared to provide alcohol cessation education. Yet, in contrast to tobacco cessation counseling preparation, few respondents believed that dental hygienists should be prepared to provide alcohol cessation education. There was a significant relationship ( $p < .05$ ) between screening for all three aspects of tobacco use and agreement of dental hygienists that they were adequately prepared to provide tobacco cessation education. Of seven background characteristics, practice setting was the only one found to be positively associated ( $p < .05$ ) with even one of three complete medical history screening indices—the practice of assessing all three tobacco screening items.

**Conclusion.** There is a need to provide more complete and accurate information in tobacco and alcohol educational programs for Maryland dental hygienists. Additional research is needed to explore sources of noninterest or discomfort in assessing patients' use of these substances, since a substantial number of Maryland dental hygienists do not assess all aspects of patients' tobacco and alcohol usage and do not agree that dental hygienists should be prepared to provide tobacco and alcohol cessation education for their patients. Maryland dental hygienists' opinions regarding the adequacy of their tobacco and alcohol cessation education appear to accurately reflect their practice of obtaining comprehensive medical histories regarding these substances.

**Keywords.** Oral cancer, oral cancer screening, oral cancer risks, tobacco, alcohol

tors for, and signs and symptoms of, oral cancer among Maryland adults. In fact, only 20% reported having had an oral cancer examination during the past year.<sup>6</sup> The nature and scope of dental practice makes oral health care professionals primary sources for evaluating the potential impact both of early detection and high risk behavior assessment practices in reducing late-stage oral cancer diagnoses.

Few studies have specifically examined dental hygienists' role in reducing oral cancer morbidity and mortality. An initial step in addressing the high national oral cancer morbidity and mortality is to focus on states with unusually high rates and to study health professionals' knowledge, opinions, and practices regarding a largely preventable disease. Dental hygienists are an untapped resource for identifying professional risk assessment practices and knowledge levels regarding oral cancer.<sup>7</sup> No studies to date have specifically examined dental hygienists' practices concerning the assessment of patients' alcohol and tobacco history and their role in early identification of patients at high risk for oral cancer. The following research provides support for the vital role that dental hygienists have in identifying patients at high risk for oral cancer by employing risk assessment practices.

## Review of the Literature

In contrast to breast, colorectal, and prostate cancers, survival rates for oral cancer have not improved and survival rates for African Americans have even decreased.<sup>2</sup> Poorer survival rates among African-Americans may be attributed to greater odds of diagnosis at later stages of disease. The higher proportion of late-stage oral cancer diagnoses among African-Americans may be explained by their less frequent participation in screening activities, lower utilization of preventive

health services, and lesser odds than Caucasian Americans in recognizing oral cancer symptoms.<sup>8</sup> Stage of disease at the time of diagnosis is the most critical prognostic determinant, although prognosis also varies according to tumor location, gender, and age of patient.<sup>9</sup> Advanced oral cancers decrease long-term prognosis,<sup>4</sup> and the more inaccessible the intra-oral structure, the more likely—without thorough examination—that a lesion may go undetected for a longer period of time.<sup>10,11</sup>

Males are more likely than females to develop oral cancer and their risk increases with age.<sup>2</sup> However, one recent study reported new evidence that women may have a greater risk for oral cancer than men even among nonsmokers. Nutritional deficiencies, lower dietary intake of fruits and vegetables, and higher levels of estrogen in females were hypothesized as possible explanations.<sup>12</sup> Differences in oral cancer risk also seen among African-Americans and Caucasian adults may be explained by recent studies providing the first evidence that greater nicotine metabolism and intake occurs in black versus white smokers. Higher serum levels of cotinine (the primary metabolite of nicotine) found per cigarette smoked by African-American smokers indicate a higher intake of nicotine per cigarette by African-Americans, in comparison to Caucasian or Mexican-American smokers.<sup>13,14</sup> Slower clearance of cotinine, a greater nicotine intake, and therefore greater tobacco smoke intake per cigarette by blacks, may partially explain the racial and ethnic differences in smoking-related diseases.

Overall, U.S. adults are not well-informed about risk factors and signs and symptoms of oral cancer, and do not receive routine oral cancer examinations at their health care visits.<sup>7,15-17</sup> Employing thorough examination and risk factor assessment techniques for oral cancer can help health care professionals identify and target patients at high risk.<sup>7,15,18</sup> Veterans at high risk for

oral cancers are less likely to have visited a dental practice in the previous year.<sup>19</sup> Still, oral health care providers are in a position to be the first health care providers to detect oral cancer, well before their attending patients experience symptoms.<sup>10</sup>

Use of alcohol and tobacco products are established high risk factors for oral cancer,<sup>20</sup> yet studies have shown that physicians and dentists do not always assess their patients' use of alcohol and tobacco.<sup>21-23</sup> Earlier detection of oral cancer is pivotal to reducing high morbidity and mortality.<sup>10,24,25</sup> However, early oral cancers are often asymptomatic.<sup>24</sup> Reliance on intra- and extra-oral examinations alone is insufficient for addressing early recognition of at-risk patients.

There have been numerous discussions of the nature and characteristics of risk assessment in disease prevention and health promotion, as well as the applications of risk assessment principles to dentistry. Medical histories as a source of patient risk information also have received recent attention.<sup>26-28</sup> Considerable efforts also have been made to study tobacco and alcohol use both as generalized risk factors and as risk factors for specific diseases, including oral cancer.

While it has long been recognized that dental hygienists play an important role in health promotion and disease prevention, the full potential contributions of dental hygienists to risk assessment practices has yet to be studied. This is particularly the case with respect to oral cancer risk assessment. Concepts of risk assessment, risk factor identification, and the role of dental hygienists in addressing oral cancer morbidity and mortality are expanded upon below to contextualize further the objectives of the present study.

**Risk Assessment:** Risk assessment is essential when planning preventive programs, whether for an individual or a large community

health promotion program. Identifying major risk factors for disease is the first step in risk assessment, which is not a new technique in dentistry. Risk assessment for caries and periodontal disease have been previously described.<sup>29</sup>

**Medical Histories:** Many routinely treated patients have medical conditions that have not been explored by dental providers. According to a 1995 study, a discrepancy rate greater than 86% was discovered when comparing the data elicited by outpatient medical records with that recorded using dental medical records.<sup>30</sup> Advanced provider medical history-taking skills and greater level of specificity and sensitivity for patient health questionnaires are requisites, given the ever-increasing complexity of patient medical histories, the need to obtain comprehensive patient information, and the necessity of focusing on prevention of disease.

Medical history forms used during the educational process of health care professionals are important teaching tools to influence future practice behaviors.<sup>26,27</sup> In terms of oral cancer prevention, medical history questionnaire forms should be designed to determine patients' oral cancer risk, including use of tobacco and alcohol, and, use of sunscreens and protective clothing to assess skin cancer risk.<sup>7</sup> Tobacco and alcohol questions on medical histories should assess specifically: 1) past use, 2) current use, 3) type used, 4) quantity used, 5) duration of use, 6) frequency of use, and 7) interest and intent to cease use.<sup>27</sup> However, in a 1996 study assessing dental hygiene schools' medical history forms, 36% of the schools did not include any questions on tobacco and alcohol use.<sup>28</sup> Deficiencies in assessment of patients' high-risk behaviors for oral cancer also were found in a study of U.S. and Canadian dental schools' medical history forms.<sup>27</sup> Nearly 25% of the dental schools did not include any questions on tobacco and alcohol use.

Great variability existed among all dental and dental hygiene schools' medical history forms when assessing patients' history of tobacco and alcohol use with respect to past and present use, duration, and amount/type of use.<sup>27,28</sup> A survey of U.S. general dentists revealed extensive variability regarding dentists' assessment of oral cancer's major risk factors.<sup>23</sup> Tobacco use was assessed more frequently than alcohol use, with present usage of the products addressed more frequently than that of the past.

**Major Risk Factors:** Early oral cancer diagnosis is possible because asymptomatic lesions can be detected clinically.<sup>24</sup> Mashberg and Samit<sup>24</sup> targeted failure to identify and address patients' high risk factors as one of several reasons for poor diagnostic yields for early detection of oral cancers. Habitual use of alcohol and tobacco are identifiable high risk factors for oral cancer and account for the majority of all oral and pharyngeal cancers.<sup>31,32</sup> Both are independent risk factors, but when combined, increase risk exponentially.<sup>31</sup> An elevated risk in the development of oral and oropharyngeal cancer was found for moderate and higher alcohol consumption and higher tobacco consumption, with the effect of alcohol being stronger than tobacco.<sup>33</sup>

Health care practitioners must routinely assess their patients' use of tobacco and alcohol products and provide cessation counseling.<sup>7</sup> Much of the morbidity and mortality attributed to oral cancer could be prevented by eliminating these high risk behaviors.<sup>3,7,25,31</sup>

**Tobacco Use:** Tobacco use increases the risk of developing oral cancer.<sup>31</sup> However, its specific carcinogenic effect on anatomic sites of the oral cavity and oropharynx is not clear. Some investigators suggest that independent carcinogenic and metabolic pathways may be involved in the development of oral cancer and that inactivation of tumor suppressor genes

like p53 result from exposure to tobacco carcinogens.<sup>34</sup> One study of U.S. veterans determined that tobacco smoking, as well as alcohol drinking, had a direct contact effect on the oral mucosa.<sup>20</sup> Differences in effect of different types of tobacco products on mucosal penetration of tobacco carcinogens may also occur among varying regions of the oral mucosa. Tobacco smoking is often associated with lesions found in sites heavily exposed to inhaled smoke, and was more strongly associated with soft-palate lesions than with lesions in more anterior sites.<sup>20</sup> However, pipe and cigar smoking were more closely associated with cancers of the floor of the mouth and buccal mucosa than the tongue or pharyngeal cancer.<sup>31</sup>

Amount of tobacco used is associated with higher risk for oral cancer. Another study of U.S. veterans found that a trend towards higher oral cancer risk occurred with increasing average consumption of cigarettes and pipes; although no discernable dose-risk trend was seen with cigar use.<sup>32</sup>

The type of tobacco product used also has been linked to varying degrees of oral cancer risk. Use of filtered cigarettes reduces the contact with tobacco juice, compared to nonfiltered cigarettes. Therefore, filtered cigarettes reduce risk for oral cancer.<sup>12</sup> U.S. veterans who smoked filtered cigarettes had a lower risk of oral cancer than that of smokers of unfiltered cigarettes.<sup>32</sup> In another case-control study, risk for oral and pharyngeal cancer was not as high among male lifelong filter cigarette smokers as it was among lifelong unfiltered cigarette, cigar, or pipe smokers.<sup>31</sup> Additionally, menthol cigarette smoking was associated with lower risk for oral cancer than smoking other types of cigarettes.<sup>32</sup> Smokers of only cigars or pipes had an oral cancer risk comparable to that of light cigarette smokers.<sup>32</sup> Another study found that smoking only pipes or cigars increased risk



of oropharyngeal cancer at nearly the same rate as cigarettes.<sup>31</sup>

Knowledge of patients' experience with tobacco products provides important insights into their potential risk for developing cancer.<sup>27</sup> Knowing not only patients' present use of tobacco, but previous history and the duration of use, provides oral health care professionals with additional information pertaining to long-term history of tobacco use and allows identification of persons who may have ceased using tobacco recently. Although in one study, no trend in oral cancer risk was linked to the duration of time spent chewing tobacco.<sup>32</sup> On the other hand, duration of time spent smoking tobacco products was positively correlated to oral cancer risk.<sup>32</sup>

Sharp reductions in oropharyngeal cancer risk after just short periods of time following smoking cessation suggest that smoking primarily affects the late stages of oral carcinogenesis.<sup>31</sup> Even though quitting smoking has been associated with reduced oral cancer risk, the risk is still present.<sup>32</sup> Patients with a history of smoking also were found to have a lower rate of survival than nonsmokers.<sup>35</sup> This finding underscores the important role of health care providers in assisting patients to be tobacco free. Tobacco cessation interventions are effective when applied in a timely manner and readily available for use by health care professionals.<sup>36</sup>

**Alcohol Use:** Most heavier alcohol consumers also are tobacco users and vice versa.<sup>31,34</sup> Several studies<sup>31,32,37</sup> describe an independent and synergistic relation between oral cancer and use of alcohol and tobacco, even though tobacco is not requisite to alcohol-related cancer. Heavier alcohol consumption alone on a regular basis is a significant risk factor in the development of oral cancer. Some investigators consider increased consumption of alcohol to have a greater effect on the development of oral and oropharyngeal

cancer than increased consumption of tobacco.<sup>31</sup> Though, among females in one study, the effect of tobacco smoking appeared to present a greater risk for oropharyngeal cancer development compared to alcohol use.<sup>33</sup>

In another study, results relating to consumption of alcohol among U.S. veterans suggest that an increased oral cancer risk existed with increased daily consumption of alcohol up to a certain point and then leveled off.<sup>32</sup> It also was found that among individuals who smoked cigarettes and also consumed alcohol, doubling the alcohol consumption resulted in a greater risk for oral cancer than did doubling cigarette use.<sup>32</sup> Measures to prevent oral cancer should target eliminating intake of both alcohol and tobacco.<sup>31</sup>

The specific carcinogenic mechanism of alcohol is not known, but its relation to oral cancer has been well established. The cause may be linked to the dehydrating contact effects of alcohol, which leaves the oral mucosa susceptible to things like carcinogens, alcohol-induced nutritional deficiencies, differences in effect of different types of alcohol on mucosal penetration of carcinogens among regions of the oral mucosa, and carcinogens contained in alcoholic drinks, such as nitrosamines and hydrocarbons.<sup>18,20,24,31</sup>

The direct contact effect of alcohol drinking was evidenced in a higher odds ratio for cancer of the floor of the mouth and tongue, that is, areas of the mouth serving as a reservoir and channel for alcoholic beverages.<sup>20</sup> Tissues at highest risk have a thin epithelium, relatively little keratin, and a submucosa containing fat and glands.<sup>24</sup> In contrast, tissues at lowest risk for oral cancer (i.e. dorsum of tongue, hard palate, buccal mucosa) are more richly keratinized. Unprotected by keratin, high-risk sites may be more subject to the local effects of carcinogens.<sup>24</sup> Differences in alcohol levels of different types of beverages may impact the extent to which

these carcinogens affect various regions of the oral mucosa.

The type of alcohol consumed also has been shown to produce various trends in oral cancer risk. One study found that the risk of oropharyngeal cancer was highest for beer and hard liquor consumption, while little or no excess risk existed for wine drinking.<sup>31</sup> Researchers in another study found that consumers of mixed drinks are at a higher risk than pure beer drinkers or whiskey drinkers, but wine drinking also produced a high risk for oral cancer.<sup>32</sup>

Researchers have proposed that duration of alcohol use may place a person at greater risk for certain health effects.<sup>38</sup> Knowledge of patients' experience with alcohol may provide important insights into their oral cancer risk potential.<sup>27</sup> Knowing not only patients' present use of alcohol, but previous history and the duration of use, provides oral health care professionals with additional information pertaining to long-term history of alcohol use and allows identification of persons who may have ceased using alcohol only recently. Though little is known either about changes in risk potential following alcohol cessation or about the delayed effects of a previous history of alcohol use, health care providers should encourage their patients to control alcohol use.

Some researchers have found that alcohol history also plays a critical role in influencing oral cancer patient survival.<sup>35</sup> Alcohol use alone was associated with a higher risk of death for nonsmokers with oral cancer than for similar patients without a history of alcohol use. These data also support clinical cancer control initiatives to improve oral cancer survival through the prevention and control of alcohol use among patients.

**Dental Hygienists' Role:** Standard quality health care mandates thorough oral, head, and neck examinations and oral disease risk factor assessment for all patients on a routine basis.<sup>7,15</sup> Unfortunately, dental

hygienists do not routinely engage in tobacco use assessment or cessation interventions for their patients.<sup>39-42</sup>

The preventive nature and scope of dental hygiene practice is particularly amenable to the practice of early recognition of patients at risk, thus allowing for the application of timely and effective interventions, as well as referral for early diagnosis of oral cancer. However, few studies have addressed the dental hygienist's role in prevention and control of oral cancer. Dental hygienists' frequency and length of patient contact, keen assessment skills, preventive and educational techniques employed during practice, and commitment to improving the oral and general health of the public warrants exploration of their role in high risk factor assessment and earlier oral cancer detection.

**Context, Objectives, and Scope of Study:** Given Maryland's alarmingly high oral cancer mortality rates and as part of a statewide needs assessment of health care providers and the public, dental hygienists were surveyed to assess their knowledge, opinions, and practices regarding oral cancer. Objectives of this study were to: 1) assess selected aspects of Maryland dental hygienists' knowledge of major risk factors for oral cancer; 2) determine Maryland dental hygienists' practice of medical history assessment regarding patients' current and past tobacco and alcohol use; 3) describe relations between Maryland dental hygienists' background characteristics and assessments of patients' current and past tobacco and alcohol use; and 4) explore associations between the comprehensiveness of tobacco and alcohol assessment and dental hygienists' opinions about tobacco and alcohol counseling.

## Methods and Materials

The protocol for this study received full approval for exemp-

tion status from the University of Maryland, Baltimore Institutional Review Board. Information on dental hygienists' oral cancer knowledge, risk assessment practices and opinions about the personal adequacy of, and general need for preparation to provide tobacco and alcohol cessation counseling was obtained through a statewide survey of Maryland dental hygienists. The data source was the Maryland Oral Cancer Survey of Dental Hygienists administered in November 1997 (MDOCSDH, 1997).

To carry out this survey, a mailing list of all member and non-member Maryland licensed dental hygienists (N=2,677) was secured from the Maryland Dental Hygienists' Association. A pilot study of 30 Maryland dental hygienists with a response rate of 57% (n=17) was conducted in summer 1997 to refine the survey instrument and methodology. In November 1997, the piloted 40-item survey instrument, cover letter, and addressed, stamped envelope were mailed to a random sample of 700 Maryland registered dental hygienists. The questionnaire assessed Maryland dental hygienists' knowledge, opinions and practices regarding oral cancer. A follow-up postal card was mailed one week later, and two additional complete mailings were sent to all non-respondents at three and seven weeks, respectively, after the initial mailing.<sup>43</sup>

Throughout the data collection phase, non-practicing Maryland dental hygienists (individuals out of the dental hygiene profession and practitioners who had moved out of state) were asked to return blank surveys since they were not eligible to participate. Based on these field procedures, 331 usable questionnaires were received, yielding a response rate of 60% from the 556 eligible respondents. Due to the low response rate, unweighted data were used in the data analyses. Stratified and logistic data analysis techniques as implemented in SAS and

SUDAAN software were used to analyze the data with the results evaluated at the .05 significance level.

This article reports parallel findings on specific aspects of Maryland dental hygienists' knowledge of tobacco and alcohol as oral cancer risk factors, practices of assessing patient use of tobacco and alcohol in taking a medical history, and related opinions about tobacco and alcohol cessation educational preparation. Parallel findings on relationships between dental hygienists' background characteristics and their assessment of tobacco and alcohol use, and on associations between the comprehensiveness of their tobacco and alcohol assessments, and their opinions about tobacco and alcohol cessation counseling also are presented.

## Results

**Practitioner background characteristics:** Mirroring national statistics, the majority of respondents (99%) were female (Table I). A clear majority of the respondents were between 31-50 years of age (73%). Most had graduated from their entry level dental hygiene programs between 1970-1989, with an associate's degree being the most frequently earned degree (58%). Nearly 60% of the respondents indicated holding membership in one of the two dental hygiene national organizations: The American Dental Hygienists' Association (54%) and the National Dental Hygienists' Association (5%). Of the respondents, 89% indicated that they spent the greatest number of hours working in general practices; 7% worked primarily in specialty practices; nearly 2% percent reported that their primary work site was in a public health/government setting; and more than 2% indicated working in other types of facilities. None reported practicing in hospital-based settings.

Table I. Dental hygienists' background characteristics

Characteristic	Respondents	
	Number	Percent* distribution
<b>All Respondents</b>	<b>331</b>	<b>100.0</b>
<b>Gender</b>		
Female	323	99.4
Male	2	0.6
<b>Age</b>		
<24-30	55	16.7
31-40	131	39.8
41-50	110	33.4
51-65+	33	10.0
<b>Graduation year from entry level dental hygiene program</b>		
1990-1997	89	27.2
1980-1989	101	30.8
1970-1979	103	31.4
pre-1970	35	10.5
<b>Degree awarded upon graduation from entry level program</b>		
Certificate in dental hygiene	37	11.4
Associate degree in dental hygiene	187	57.7
Baccalaureate degree in dental hygiene	100	30.9
<b>Highest degree earned</b>		
AA/AAS	160	50.3
BS/BA	133	41.8
Master's	14	4.4
Doctorate	3	0.9
Other	8	2.5
<b>Membership in professional organizations</b>		
American Dental Hygienists' Association	177	53.5
National Dental Hygienists' Association	15	4.5
American Public Health Association	—	—
American Association of Public Health Dentistry	2	0.6
American Association of Dental Schools	3	0.9
International Association for Dental Research	4	1.2
Other	20	6.0
No membership in any professional organization	110	33.2
<b>Practice Setting</b>		
General practice	292	88.8
Specialty practice	24	7.3
Public health/Government	6	1.8
Hospital practice	—	—
Other	7	2.1

\* Percentages may not add to 100 due to rounding.  
 Source: MDOCSDH, 1997.

**Knowledge of tobacco and alcohol as risk factors for oral cancer:** Figure 1 depicts these Maryland dental hygienists' knowledge of tobacco and alcohol use as oral cancer risk factors. To assess accuracy of knowledge regarding tobacco and alcohol as oral cancer risk factors, respondents were asked a series of questions regarding various risk factors that place individuals at high risk for oral cancers. More than 99% of the respondents identified use of tobacco products as placing an individual at high risk for oral cancers.

Respondents were less knowledgeable about two specific aspects of tobacco use as risk factors. One-third (33%) knew that lesions associated with smokeless tobacco generally resolve when its use is discontinued. Very few (10%) correctly identified that the use of smokeless tobacco does not place a person at greater risk for oral cancer than those who smoke cigarettes. About 9 out of 10 respondents (89%) knew that alcohol use was a high-risk factor for oral cancer.

**Aspects of tobacco and alcohol probed in medical histories:** Figure 2 shows the percentages of dental hygienists who probed for various aspects of tobacco and alcohol use during medical history taking. When asked about aspects of tobacco use probed during medical history taking, the vast majority (94%) assessed patients' present use and more than three-quarters (79%) assessed both past use and type and amount of tobacco used. However, less than two-thirds (61%) probed their patients' present use of alcohol in medical histories and even less (48%) assessed patients' past use and type/amount of alcohol used (30%).

**Number of aspects of tobacco and alcohol probed in medical histories:** Figure 3 shows the percent distribution

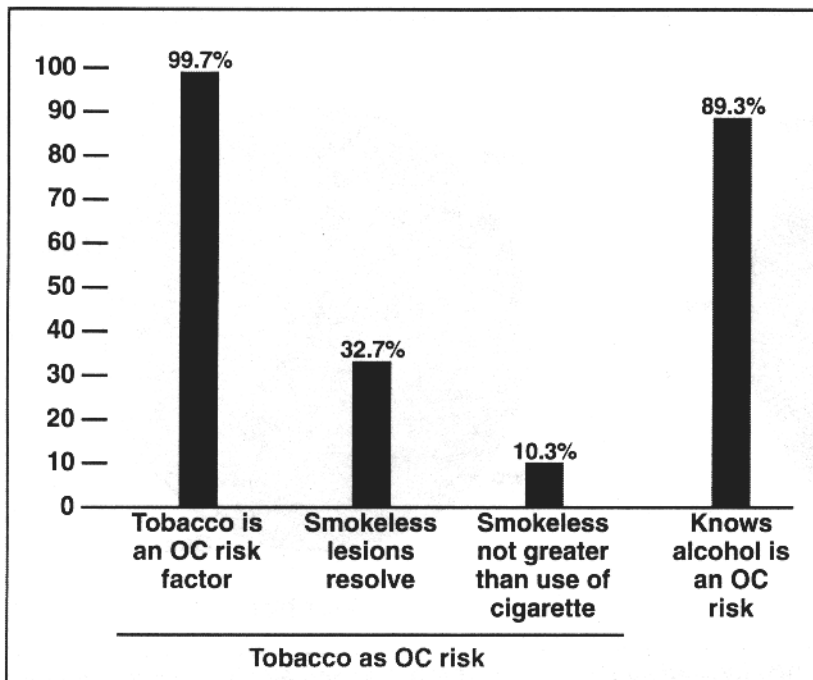


Figure 1. Knowledge of tobacco and alcohol use as oral cancer risk factors: Maryland 1997. n=331 Source: MDOCSDH, 1997

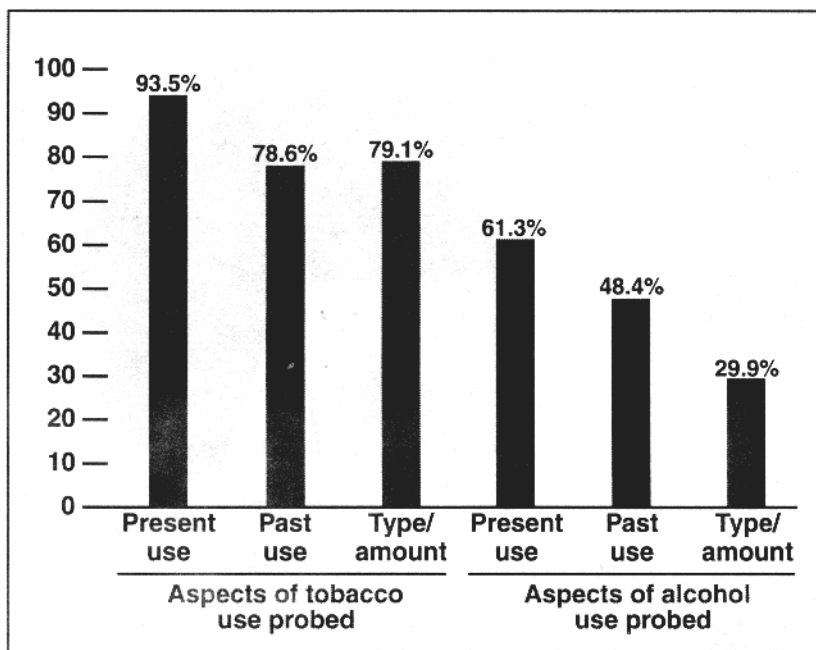


Figure 2. Aspects of tobacco and alcohol use probed in medical histories by dental hygienists: Maryland, 1997. n=331 Source: MDOCSDH, 1997

of respondents by the number of aspects of tobacco and alcohol use probed in medical histories. Two-thirds probed all three aspects of patient tobacco use; however, only 23% probed all three aspects of alcohol use. Of the respondents,

22% and 28%, respectively, probed two aspects of tobacco and alcohol use. Six and 13%, respectively, of dental hygienists questioned, only one aspect of tobacco and alcohol use. Six percent reported assessing no aspects of tobacco use and 37%

investigated no aspects of alcohol use when taking medical histories.

**Patterns of aspects of tobacco and alcohol probed in medical histories:** Figure 4 shows the percent distribution of dental hygienists by the pattern of aspects of tobacco and alcohol use probed in medical histories. Sixty-eight percent probed present use, past use, and type/amount of tobacco used, while only 25% probed past use, present use, and type/amount of alcohol used by patients when taking medical histories. Ten percent and 23%, respectively, probed both past and present use of tobacco and alcohol. There were 10% who looked into past use and type/amount of tobacco used, while no respondents indicated probing past use and type/amount of alcohol used. Another 5% inquired about past use only of tobacco, while 9% probed past use only of alcohol. Six percent didn't ask about any aspect of tobacco, while more than one-third of the respondents (39%) probed no aspects of alcohol use.

**Overall patterns of aspects of tobacco and alcohol probed in medical histories:** Figure 5 shows the overall patterns of tobacco and alcohol screening in medical histories. Nearly one-quarter of the responding dental hygienists probed all aspects of tobacco and alcohol use by patients when taking medical histories. However, 6% screened no aspects of tobacco and alcohol use by their patients. Twenty-one percent probed all three aspects of tobacco use, but no aspects of patient alcohol use.

**Background characteristics and completeness of tobacco and alcohol screening in medical histories:** Seven background characteristics (practice setting, typical ages of patients seen in practice, interval since last oral cancer continuing education course taken, period of graduation, entry-level certificate or degree received, number of professional association memberships held, and membership in ADHA) were explored in relationship to how complete the

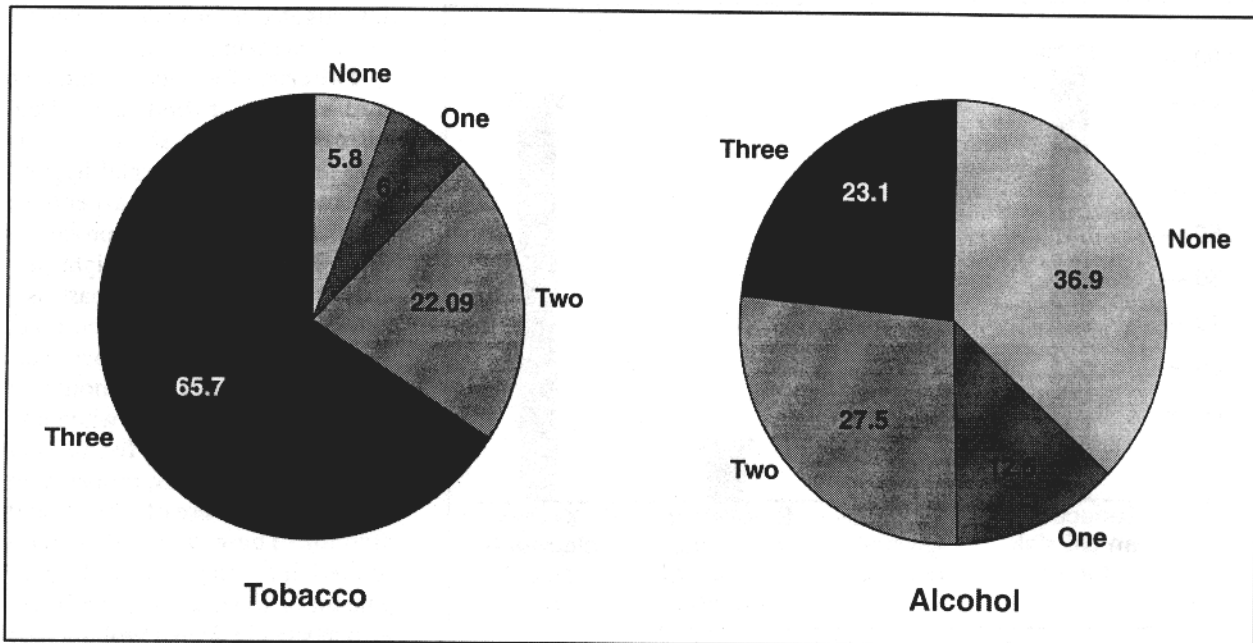


Figure 3. Percentage distribution of dental hygienists by number of tobacco and alcohol use probed in medical histories: Maryland, 1997. n=331 Source: MDOCSDH, 1997

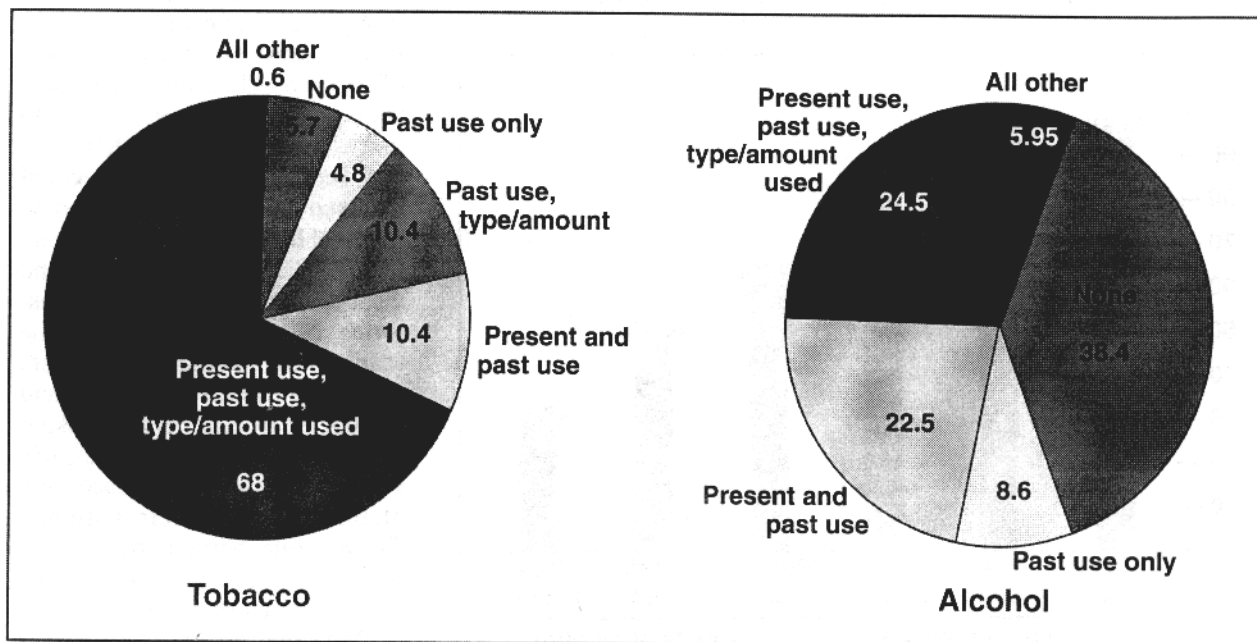


Figure 4. Percentage distribution of dental hygienists by patterns of aspects of tobacco and alcohol use probed in medical histories: Maryland, 1997. n=331 Source: MDOCSDH, 1997

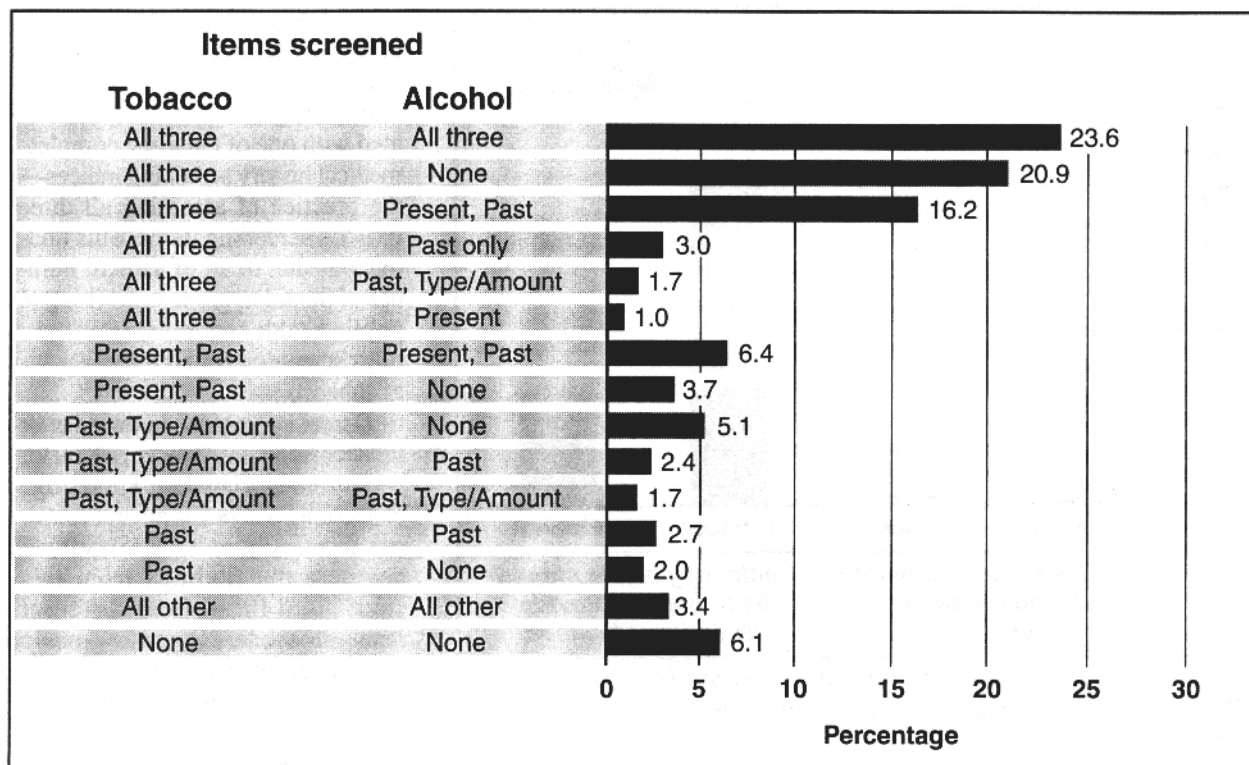
aspects of tobacco and alcohol usage were discussed while taking medical histories. Practice setting was the only one of the seven background characteristics to be significantly associated with screening for all three aspects of tobacco use (Table II). No association was found between any of the seven background characteristics and

completeness of alcohol screening in the medical history.

**Opinions regarding preparation to provide tobacco and alcohol cessation counseling:** Figure 6 shows dental hygienists' opinions regarding tobacco and alcohol cessation counseling. The study indicates 32% believed that they were adequately prepared to provide

tobacco cessation education, but less than 5% of that total strongly agreed. A clear majority (78%) held the opinion that dental hygienists should be prepared to provide tobacco cessation education for patients; however, only 26% strongly agreed with that opinion. In contrast, less than 15% of the respondents believed that they were



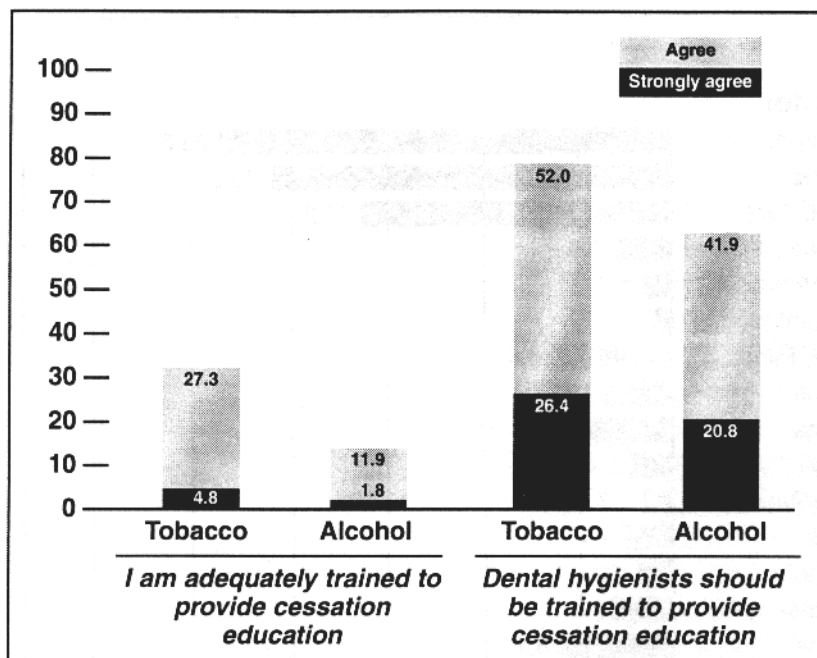


**Figure 5. Overall patterns of tobacco and alcohol screening in medical histories by dental hygienists: Maryland, 1997. n=331 Source: MDOCSDH, 1997**

**Table II. Unadjusted effects of dental hygienists' background characteristics on three indices of the completeness of tobacco/alcohol screening in medical histories: Maryland, 1997 (N=331)**

<b>Background characteristics</b>	<b>Dental Hygienist Screened for:</b>		
	<b>All three tobacco items</b>	<b>All three alcohol items</b>	<b>All six tobacco and alcohol items</b>
	<i>p values for total effects</i>		
Practice setting	.00	.38	.50
Typical age of patients seen in practice	.34	.55	.30
Recentness of oral cancer continuing education	.44	.31	.36
Period of graduation	.42	.15	.35
Entry-level degree	.65	.69	.70
Number of professional association memberships	.16	.86	.91
Membership in ADHA	.52	.80	.91

Source: MDOCSDH, 1997.



**Figure 6. Opinions regarding tobacco and alcohol cessation counseling among dental hygienists: Maryland, 1997. n=331**  
 Source: MDOCSDH, 1997

adequately prepared to provide alcohol cessation education, and fewer than two-thirds held the opinion that dental hygienists should be prepared to provide alcohol cessation education for patients.

Figure 7 shows the association between completeness of tobacco and alcohol screening in medical histories and opinions about tobacco and alcohol cessation counseling among Maryland dental hygienists. The relationship between dental hygienists' beliefs that they were adequately prepared to provide tobacco cessation education for their patients and screening for all three aspects of tobacco use when taking medical histories was significant ( $p=.04$ ). No other significant associations were found between completeness of tobacco and alcohol screening in medical histories and opinions that dental hygienists should be prepared to provide tobacco and alcohol cessation education. Nor were there any significant associations between screening for all three aspects of alcohol use among patients and

individuals' opinions about the adequacy of their alcohol cessation education preparation.

## Discussion

Although background characteristics of the responding dental hygienists are consistent with characteristics of dental hygienists nationwide,<sup>44</sup> the response rate and small sample size of dental hygienists registered in one northeastern state in this study limit generalizing results beyond the study respondents. Since respondents more likely represent practitioners with some interest in, or even concern about, oral cancer, if there is potential bias due to non-response, it may be in the direction that lack of knowledge of tobacco and alcohol use as oral cancer risk factors are underestimated and that the practice of assessing various aspects of risk behaviors is overestimated.

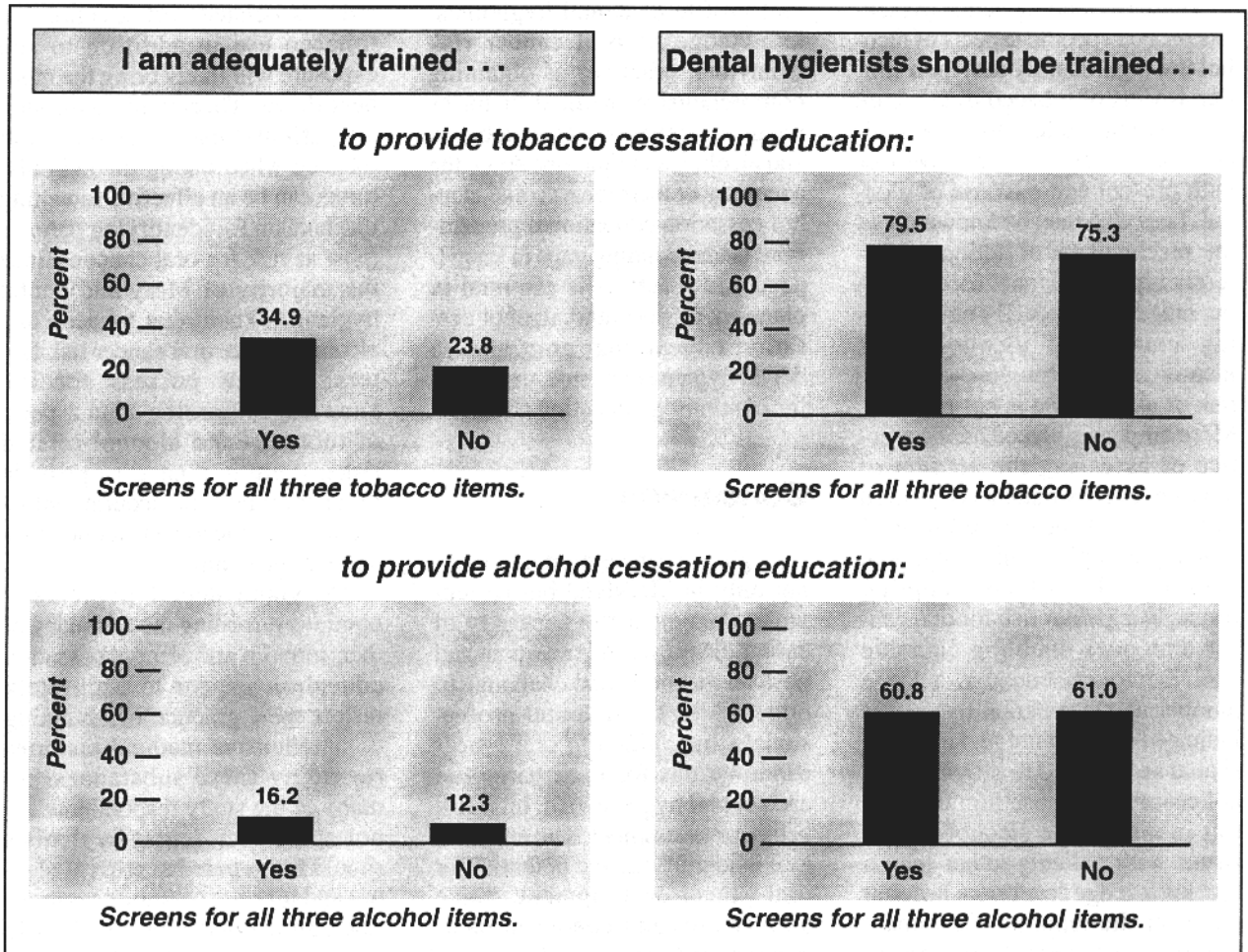
The small sample size in this study also limits the extent to which background characteristics

can be taken into account in various analyses. Only one of the seven background characteristics, practice setting, was positively associated with one of the three complete medical history screening indices—the practice of assessing all three tobacco screening items. This finding was due to all of a small number of dental hygienists working in public health and government settings screening for all three aspects of tobacco use.

Dental hygienists' knowledge of tobacco as an oral cancer risk factor was stronger than their knowledge concerning alcohol as an oral cancer risk factor (Figure 1). It is useful to compare the findings from this study with those from different research studies regarding basic knowledge of risk factors for oral cancer among Maryland veterans,<sup>19</sup> U.S. dentists,<sup>22,23</sup> and U.S. adults.<sup>17</sup> The majority of Maryland veterans<sup>19</sup> (84%) correctly identified tobacco use as a risk factor, as did the vast majority of Maryland dental hygienists (98%). However, only a small minority of Maryland veterans correctly identified alcohol use (39%) as a risk factor compared to 89% of Maryland dental hygienists.

Maryland dental hygienists' knowledge of risk factors for oral cancer was comparable to that of U.S. dentists, who correctly identified use of tobacco products (99.6%) and use of alcohol (90.8%) as major risk factors for oral cancer.<sup>22,23</sup> U.S. adults scored the lowest among all groups for knowledge levels—67% correctly identified tobacco use and only 13% identified alcohol use as oral cancer risk factors.<sup>17</sup> Since across all groups there was a higher level of knowledge about tobacco use as a risk factor rather than alcohol use, even among lay individuals, more generalized knowledge of tobacco versus alcohol risk may be available to the public.

These Maryland dental hygienists' overall feelings of adequacy regarding their preparation to provide tobacco cessation education



**Figure 7. Association between completeness of tobacco/alcohol screening in medical histories and opinions about tobacco/alcohol cessation counseling among dental hygienists: Maryland, 1997. n=331 Source: MDOCSDH, 1997**

were greater than U.S. dental hygienists' feelings of preparedness in helping patients stop tobacco use as assessed in a recent national survey of dental and dental hygiene professionals. Only 17% of U.S. dental hygienists felt that they were well-prepared to help patients stop tobacco use,<sup>42</sup> whereas, 32% of the Maryland dental hygienists in this study felt adequately prepared to provide tobacco cessation education. However, in comparison to an earlier regional study which included Maryland, four other states and the District of Columbia, Fried and Rubinstein<sup>40</sup> reported that 54.9% of their responding dental hygienists felt adequately prepared to provide tobacco cessation

counseling for patients. Variations in opinions about tobacco cessation counseling preparedness may be reflective of statewide and/or regional differences in efforts to inform dental hygienists in educational programs or only place selective emphasis on tobacco cessation campaigns.

In the multi-regional U.S. study of dentists and dental hygienists, routine assessments of tobacco use among patients were not conducted.<sup>42</sup> It is encouraging to note that the majority of Maryland dental hygienists reported that they assessed patients' present use of tobacco, and therefore identified individuals at risk for oral cancer (Figure 2). Also encouraging is the

fact that the majority of dental hygienists also assessed patients' past use of tobacco. Although an individual may have quit tobacco use, some risk for oral cancer would still be present because of prior cumulative effects of tobacco use.

Since the majority of these Maryland dental hygienists also assessed type and amount of tobacco used (Figure 2), site-specific lesions associated with use of certain forms of tobacco may provide dental hygienists with key areas on which to focus when performing oral cancer examinations. Knowing the amount of tobacco used identifies potential cumulative risk with regard to knowledge of the dose-response effect of tobacco use.

These responding dental hygienists probed specific aspects of alcohol use significantly less than similar aspects of tobacco use (Figure 2). This may reflect lower knowledge levels regarding relative risk with present and past use of alcohol. Less also may be known about the mechanisms of action of different types of alcohol for increasing oral cancer risk. By not assessing amount of alcohol used, identification of the dose-response risk of alcohol use is not possible. More emphasis placed on the practice of assessing the amount of tobacco used by patients compared to amount of alcohol used, may reflect the lack of knowledge that doubling alcohol consumption results in a greater risk for oral cancer than does doubling cigarette use. However, because a large number of these dental hygienists indicated they did not feel that they should be prepared to provide alcohol cessation counseling, discomfort in addressing alcohol-related issues with patients rather than a low knowledge level may account more for the reported assessment practices of dental hygienists regarding this substance. Dental hygienists also may not be doing their part to educate the lay public about alcohol as an oral cancer risk factor, nor probing alcohol use as an oral cancer risk among patients as reflected by pervasive unenthusiastic opinions about their responsibility for conducting alcohol cessation counseling.

Since practices of clinicians are influenced by their beliefs, values and attitudes<sup>7,21</sup> and the clinical behaviors attained while undergoing academic and professional education,<sup>15,26,27,45,46</sup> feelings of inadequacy and discomfort with providing alcohol cessation education for patients may be reasonably attributed to curricula in continuing education courses and dental hygiene programs that may not adequately address these types of sensitive issues.

Despite study limitations, the survey findings provide an impor-

tant profile of dental hygienists' knowledge of oral cancer risk behaviors, practices of obtaining comprehensive medical histories regarding patients' use of tobacco and alcohol, and opinions about the adequacy of their tobacco and alcohol cessation educational preparation. Understanding gaps in knowledge and practices is essential in planning tobacco and alcohol cessation educational programs in dental hygiene curricula, as well as for continuing education courses.

## Conclusion

High oral cancer mortality rates, not only in Maryland but nationwide, document the necessity of earlier diagnosis and treatment and pose an incentive and challenge to both medical and dental professionals. In addition to oral cancer examinations for each patient at each dental hygiene visit, high risk behavior assessment is an essential tool in identifying the potential for oral cancer development. Since tobacco use and alcohol consumption are established risk factors for oral cancer that are preventable behaviors, educational efforts to curb smoking and alcohol use may aid in reducing oral cancer morbidity and mortality. Oral health professionals' up-to-date knowledge of risk factors and constant awareness during patient care are key features in the early detection of oral cancer and in the control of the clinical course of the disease. Dental hygienists can play a vital role in identifying individuals at risk, educating those at high risk, and in detecting oral cancer at an early stage.

There are several practices that could reduce the morbidity and mortality rates from oral cancer. For example, utilizing appropriate screening mechanisms for high risk behaviors, detecting lesions early through routine cancer examinations, educating patients about signs and symptoms of oral cancer, and counseling patients about the

risks associated with alcohol and tobacco use in addition to sun exposure will likely bring the numbers down. Thoroughly assessing all patients' use of alcohol and tobacco when taking medical histories can be an effective screening mechanism for identifying patients most at risk for oral cancer. Since the majority of Maryland dental hygienists know that tobacco and alcohol use are oral cancer risk factors, yet few possess specific knowledge regarding other aspects of tobacco- and alcohol-related risks, there is a need to provide more complete and accurate information in tobacco and alcohol educational programs.

Maryland dental hygienists' opinions regarding the adequacy of their tobacco and alcohol cessation education appear to accurately reflect their practice of obtaining comprehensive medical histories regarding these substances. So many of the study respondents did not agree that dental hygienists should be prepared to provide alcohol and tobacco cessation counseling, and a substantial number do not assess all aspects of patients' tobacco and alcohol usage. This demonstrates that further exploration is needed to assess sources of non-interest, disinclination, or discomfort in assessing patients' use of these substances when obtaining comprehensive medical histories.

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## References

1. American Cancer Society: *Cancer Facts and Figures—1998*. Atlanta, Georgia, 1998.
2. Landis SH, Murray T, Bolden S, Wingo PA: Cancer Statistics, 1999. *CA Cancer J Clin* 1999;49:8-13.
3. Centers for Disease Control: Deaths from oral cavity and pharyngeal cancer—United States, 1987. *MMWR* 1990;39:457-460.
4. American Dental Association, Centers for Disease Control and Prevention, National Institute of Dental Research, National Institutes of Health: *Proceedings: National Strategic Planning Conference for the Prevention and Control of Oral and Pharyngeal Cancer, August 7–9, 1996*. Atlanta: Centers for Disease Control and Prevention, 1997.
5. <http://www-seer.ims.nci.nih.gov/>
6. Horowitz AM, Moon H-s, Goodman HS, Yellowitz JA: Maryland adults' knowledge of oral cancer and having oral cancer examinations. *J Public Health Dent* 1998; 58:281-287.
7. Horowitz AM, Goodman HS, Yellowitz JA, Nourjah PA: The need for health promotion in oral cancer prevention and early detection. *J Public Health Dent* 1996;56:319-330.
8. Arbes SJ, Slade GD: Racial differences in stage at diagnosis of screenable oral cancers in North Carolina. *J Public Health Dent* 1996;56:352-354.
9. Nichols C, Geist JR: Orofacial cancer: A challenge and a professional responsibility. *Dent Hyg News* 1995;8:15-19.
10. Carpenter RD, Yellowitz JA, Goodman HS: Oral cancer mortality in Maryland. *Maryland Med J* 1993;42:1105-1109.
11. Rubright WC, et al.: Risk factors for advanced-stage oral cavity cancer. *Arch Otolaryngol Head Neck Surg* 1996;122:621-626.
12. Muscat JE, Richie JP, Thompson S, Wynder EL: Gender differences in smoking and risk for oral cancer. *Cancer Res* 1996;56:5192-5197.
13. Perez-Stable EJ, Herrera B, Jacob P, Benowitz NL: Nicotine metabolism and intake in black and white smokers. *JAMA* 1998;280:152-156.
14. Caraballo RD, et al.: Racial and ethnic differences in serum cotinine levels of cigarette smokers: Third national health and nutrition examination survey, 1988–1991. *JAMA* 1998;280:135-139.
15. Goodman HS, Yellowitz JA, Horowitz AM: Oral cancer prevention: The role of the family practitioners. *Arch Fam Med* 1995;4:628-636.
16. Horowitz AM, Nourjah PA: Factors associated with having oral cancer examinations among US adults 40 years of age or older. *J Public Health Dent* 1996;56:331-335.
17. Horowitz AM, Nourjah P, Gift HG: U.S. adult knowledge of risk factors and signs of oral cancers: 1990. *J Am Dent Assoc* 1994;126:39-45.
18. Martin LM, Bouquot JE, Wingo PA, Heath CW: Cancer prevention in the dental practice: Oral cancer screening and tobacco cessation advice. *J Public Health Dent* 1996;56:336-340.
19. Canto MT, et al.: Maryland veterans' knowledge of risk factors and signs of oral cancers and their use of dental services. *Gerodontology* 1998;15:79-86.
20. Boffetta P, Mashberg A, Winkelmann R, Garfinkel L: Carcinogenic effect of tobacco smoking and alcohol drinking on anatomic sites of the oral cavity and oropharynx. *Int J Cancer* 1992;52:530-533.
21. Yellowitz JA, Goodman HS: Assessing physicians' and dentists' oral cancer knowledge, opinions and practices. *J Am Dent Assoc* 1995;126:53-60.
22. Yellowitz J, et al.: Knowledge, opinions and practices of general dentists regarding oral cancer: A pilot survey. *J Am Dent Assoc* 1998;129:579-583.
23. Horowitz AM, Drury TF, Goodman HS, Yellowitz JA: Oral pharyngeal cancer prevention and early detection: Dentists' opinions and practices. *J Am Dent Assoc* 2000; 131:453-462.
24. Mashberg A, Samit A: Early diagnosis of asymptomatic oral and oropharyngeal squamous cancers. *CA Cancer J Clin* 1995;45:328-351.
25. Winn DM, et al.: Scientific progress in understanding oral and pharyngeal cancers. *J Am Dent Assoc* 1998;129:713-718.
26. Ahluwalia KP, Yellowitz JA, Goodman HS, Horowitz AM: An assessment of oral cancer prevention curricula in U.S. medical schools. *J Cancer Educ* 1998;13:90-95.
27. Yellowitz JA, Goodman HS, Horowitz AM, Al-Tannir MA: Assessment of alcohol and tobacco use in dental schools' health history forms. *J Dent Educ* 1995;59:1091-1096.
28. Gurenlian JR, McFall DB, Mounts C, Williams C: Documenting oral cancer risk factors on health history forms [Abstract]. *J Dent Res* 1996;75:306.
29. In: Bader JD, ed.: Risk assessment in dentistry. Chapel Hill, University of North Carolina Dental Ecology, 1990.
30. Lutka RW, Threadgill JM: Correlation of dental-record medical histories with outpatient medical records. *Gen Dent* 1995;43:342-345.
31. Blot WJ, et al.: Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Res* 1988;48:3282-3287.
32. Mashberg A, Boffetta P, Winkelmann R, Garfinkel L: Tobacco smoking, alcohol drinking, and cancer of the oral cavity and oropharynx among U.S. veterans. *Cancer* 1993;72:1369-1375.
33. Sanderson RJ, et al.: The influence of alcohol and smoking on the incidence of oral and oropharyngeal cancer in women. *Clin Otolaryngol* 1997;22:444-448.
34. Lazarus P, et al.: p53, but not p16 mutations in oral squamous cell carcinomas are associated with specific

- CYP1A1 and GSTM1 polymorphic genotypes and patient tobacco use. *Carcinogenesis* 1998;19:509-514.
35. Yu GP, et al.: Smoking history and cancer patient survival: A hospital cancer registry study. *Cancer Detect Prev* 1997;21:497-509.
  36. The Smoking Cessation Clinical Practice Guideline Panel and Staff: The Agency for Health Care Policy and Research Smoking Cessation Clinical Practice Guideline. *J Am Med Assoc* 1996;275:1270-1280
  37. Mashberg A, Samit A, Harris S. Alcohol as a primary risk factor in oral squamous carcinoma. *CA Cancer J Clin* 1981;31:146-156.
  38. Fleming MF, Manwell LB, Barry KL, Johnson K: At risk-drinking in an HMO primary care sample: prevalence and health policy implications. *Am J Public Health* 1998;88:90-93.
  39. Chambers AK, Corbin DE: Tobacco control activities of Iowa dental hygienists. *J Comm Health* 1996;21:375-387.
  40. Fried JL, Rubinstein L: Attitudes and behaviors of dental hygienists concerning tobacco use. *J Public Health Dent* 1990;50:172-177.
  41. O'Shea RM, et al.: Helping patients quit smoking: The dental hygienist's role. *Dent Hyg* 1987;61:373-377.
  42. Dolan TA, McGorray SP, Grinstead-Skigen CL, Mecklenburg R: Tobacco control activities in U.S. dental practices. *J Am Dent Assoc* 1997;128:1669-1679.
  43. Dillman DA: *Mail and Telephone Surveys. The Total Design Method*. New York, John Wiley & Sons, 1978, p.160-199
  44. American Dental Hygienists' Association: *Extension Study: Retention of Dental Hygienists in the Workforce. Final Report, April 1992*.
  45. Rankin KV, Burzynski NJ, Silverman S, Scheetz JP: Cancer curricula in U.S. dental schools. *J Cancer Educ* 1999;14:8-12.
  46. Tomar SL, Silverman S, Carpenter WM: Oral cancer education training methods. *J Cancer Educ* 1998;13:141-144.