

# Oral and Pharyngeal Cancer: Knowledge and Opinions of Dentists in British Columbia and Nova Scotia

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## A b s t r a c t

*Oral and pharyngeal cancers are largely preventable and can be successfully treated when diagnosed at an early stage. Dentists in British Columbia and Nova Scotia were surveyed regarding their knowledge and opinions about oral and pharyngeal cancer. In February 1998 a pretested 41-item survey was mailed to a random sample of dentists in British Columbia and the population of dentists in Nova Scotia. A reminder postcard and one additional mailing were sent to nonrespondents. Of the 670 dentists supplying usable responses (response rate 55.2%) only 56.7% agreed that their knowledge of the subject was current. Most dentists correctly identified tobacco use (99.4%) and alcohol use (90.4%) as risk factors, but fewer correctly identified factors such as the use of spicy foods (57.0%) and poor oral hygiene (46.3%) as not being risk factors. Only 42.5% identified both erythroplakia and leukoplakia, in that order, as the conditions most likely associated with oral cancer. Indices of risk and diagnostic knowledge were constructed by summing the number of correct responses to items in each domain. On 16 risk factors the mean correct score was 9.2, and on 14 diagnostic procedures the mean correct score was 10.0. Only 38.5% of dentists had consistent levels of knowledge on both indices. Differences between the provinces were statistically significant ( $p < 0.01$ ) for only 2 knowledge items. About three-quarters of all dentists (77.0%) were interested in taking continuing education courses. Dentists in British Columbia and Nova Scotia could benefit from undergraduate and continuing education courses to increase their knowledge of risk and diagnostic factors for oral cancer.*

**MeSH Key Words:** Canada; dentist's practice patterns; mouth neoplasms

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In 2000, approximately 3,200 new cases of oral cancers were identified in Canada, and about 1,050 deaths from oral and pharyngeal cancers occurred, more deaths than those caused by each of malignant melanoma, uterine and cervical cancers, and Hodgkin's disease.<sup>1</sup> Oral cancers include those of the lip, tongue, salivary glands and other sites in the mouth, whereas pharyngeal cancers affect the nasopharynx, oropharynx and hypopharynx.<sup>1,2</sup> For simplicity, the term oral cancer is used in this paper to refer to both types.

The burden of suffering associated with oral cancers is distinct from that caused by the other major oral diseases (dental caries and periodontal disease). **Table 1** compares rates of incidence and mortality in Canada, British

Columbia and Nova Scotia.<sup>1</sup> The relatively low survival rate is attributed to late diagnosis,<sup>3</sup> which occurs in more than half of all cases.<sup>4,5</sup> Survival statistics have changed little over recent decades, and oral cancers continue to receive less attention than other types of cancer. The aggregate of new cases and deaths is an important measure of burden on the Canadian population and health care system.

Age, racial origin, sex and geographic location are important variables in all cancers, especially oral cancers. Although strong overall sex differences are reflected in the male to female ratios for new cases (2.2:1) and deaths (2.3:1),<sup>1</sup> young females are at a much higher risk than young males for basal cell carcinoma of the upper lip in British Columbia, as is the case in other countries.<sup>6</sup> Rates

for cancer of both the salivary gland and the nasopharynx are 10 to 25 times higher among the Inuit than within the general Canadian population.<sup>5</sup>

Most oral cancers are attributed to the use of tobacco products that are smoked or chewed.<sup>2</sup> The combined use of tobacco and alcohol significantly increases the risk of these cancers.<sup>2</sup> Other risk factors include actinic radiation for lip cancer, a lack of fruits and vegetables in the diet, and human papillomavirus.<sup>2</sup>

Early detection is the single most critical intervention influencing survival.<sup>2,7-10</sup> The oral cavity is easily accessible and can be examined with little discomfort. Dentists, as primary care providers, can easily incorporate the screening protocol into their routine examinations.<sup>7-16</sup>

Studies of dentists in the United States and Europe have assessed their knowledge, opinions and practices regarding oral cancer. Surveys in the state of Maryland and the United States as a whole have shown that dentists are not as knowledgeable as they could be about preventing and detecting oral cancer.<sup>17-19</sup>

The purposes of this study were to assess and describe Canadian dentists' understanding of risk and diagnostic factors related to oral cancer and to determine their opinions about their professional preparation to prevent and control oral cancer.

## Methods

Dentists' knowledge and opinions related to oral cancer were determined by means of a mail survey of a probability sample in British Columbia and the population of dentists in Nova Scotia.<sup>20-22</sup> A 41-item questionnaire was constructed from items previously tested for validity and new ones unique to this survey. The instrument was validated in Canada and was pretested by a convenience sample of dentists in 3 nonsurvey provinces. A systematic random sample of 817 licensed dentists was selected from the registrars' 1997 listing of licensees in British Columbia to provide a 95% confidence level with oversampling for an expected return of 40%. The population of dentists in Nova Scotia were those licensees represented by a set of mailing labels purchased from the Nova Scotia Dental Association (membership in the professional association is mandatory for licensure in that province). The questionnaire, a cover letter and an addressed, stamped envelope were mailed in February 1998. A reminder card was sent 2 weeks after the initial mailing, and a second complete mailing was sent to all nonrespondents 4 weeks after the initial mailing.

Responses were analyzed with SPSS-PC software (SPSS Inc., Chicago, IL). Unweighted data were used in the bivariate analyses. The results were evaluated at a significance level of  $p < 0.01$ .

Analyses included the frequencies of 30 knowledge-related items and cross-tabular comparisons of these frequencies between the 2 provinces. Two indices were

**Table 1** Estimates of oral cancer incidence and mortality rates by province and sex for 2000

	British Columbia	Nova Scotia	Canada
Incidence rates (per 100,000)			
Males	12	13	14
Females	6	5	5
Age-standardized mortality rate (per 100,000)			
Males	4	6	5
Females	2	2	2

Source: Canadian cancer statistics 2000, National Cancer Institute of Canada<sup>1</sup>

constructed to consolidate knowledge of risks and diagnostic factors. Each correct response for the 16 items regarding risk factors was given a score of 1, and the correct scores were summed to yield an index of risk knowledge. Similarly, a diagnostic index was constructed by summing the number of correct responses to the 14 items regarding diagnosis.

Each index score was grouped into 3 approximately equal distributions by percentage to identify low, medium and high scores. These scores were used to construct a typology of dentists' patterns of knowledge of risk and diagnostic factors for oral cancer.

The correlation between the 2 indices was examined with one-way analysis of variance (ANOVA) comparing the mean aggregate scores of dentists in the 2 provinces on both indices. The relative effects of background characteristics on the risk and diagnostic indices were also assessed. Finally, the relationships between dentists' levels of knowledge and their opinions about the currency of their knowledge were explored.

## Results

The results are based on 670 usable responses (overall response rate of 55.2%, 50.4% [401] for British Columbia and 64.4% [269] for Nova Scotia). In total, 82.1% of respondents were men (Table 2). More than half owned solo practices, whereas about a quarter practised in partnerships and a smaller proportion were employees or contractors. Nearly 60% had graduated between 1980 and 1997, and a similar proportion had attended a continuing education course on oral cancer within the previous 5 years.

**Table 2** Characteristics of dentists who responded to a mail survey about knowledge, practices and opinions related to oral cancer

Characteristic	Provincial data (%)		Overall (both provinces) Number (and %)a
	British Columbia Number (and %)	Nova Scotia Number (and %)	
Sex			
Male	327 (83.4)	211 (80.2)	538 (82.1)
Female	65 (16.6)	52 (19.8)	117 (17.9)
Type of practice			
Solo	237 (59.3)	133 (49.6)	370 (55.4)
Partner	93 (23.3)	84 (31.3)	177 (26.5)
Salaried or contractor	57 (14.3)	36 (13.4)	93 (13.9)
All other	13 (3.4)	15 (5.5)	28 (4.2)
Date of graduation			
Before 1970	54 (13.5)	32 (12.3)	88 (13.3)
1970–1979	130 (32.4)	66 (25.4)	196 (29.6)
1980–1989	126 (31.4)	103 (39.6)	229 (34.5)
1990–1997	91 (22.7)	59 (22.7)	150 (22.6)
Interval since last continuing education course on oral cancer			
Within past 12 months	65 (16.3)	44 (16.5)	109 (16.3)
Past 2 to 5 years	145 (36.3)	123 (46.1)	268 (40.2)
> 5 years	116 (29.0)	61 (22.8)	177 (26.5)
New graduate — have yet to attend	3 (0.8)	7 (2.6)	10 (1.5)
Have never taken a course	64 (16.0)	31 (11.6)	95 (14.2)
Don't know	7 (1.8)	1 (0.4)	8 (1.2)

aSome groups of percentages do not sum to 100 because of rounding

### Knowledge of Risk Factors for Oral Cancer

Tobacco was recognized as a risk factor by almost all respondents, and other high risk factors such as prior oral cancer, use of alcohol and lip cancer related to sun exposure were correctly identified by at least 70% of respondents (Fig. 1). However, human papillomavirus and low consumption of fruits and vegetables were identified by much smaller proportions. Although most respondents knew that older age is a high risk factor, fewer than half knew that most oral cancers are found in patients 60 years of age or older.

Factors that have not been shown to pose a risk for oral cancer (“nonrisk”) were identified correctly by fewer respondents (Fig. 1). More than half knew that hot beverages and food, spicy foods and obesity are not real risk factors. However, fewer than half knew that poor oral hygiene, familial clustering of cancer and poor-fitting dentures are not real risk factors, and only a small proportion knew that a family history of cancer is not in itself a risk factor for oral cancer.

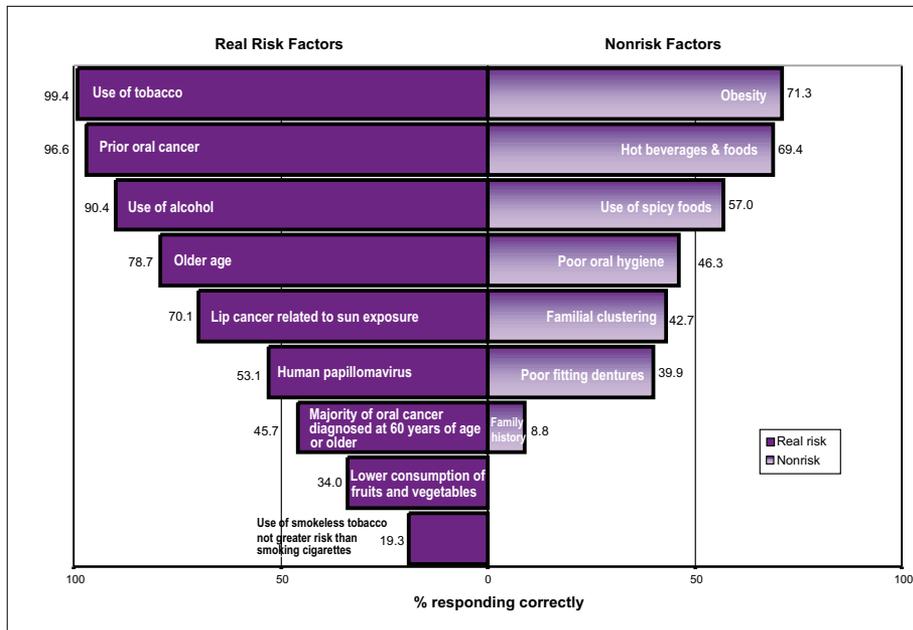
Scores on the 16-item index of dentists’ knowledge of risk factors ranged from 0 to 15 (mean 9.2). For only one risk item was the response significantly different between the provinces: a higher percentage of N.S. dentists correctly identified the association of oral cancer with lip cancer related to sun exposure ( $p < 0.01$ ). There were no statisti-

cally significant differences between the provinces in terms of mean risk scores.

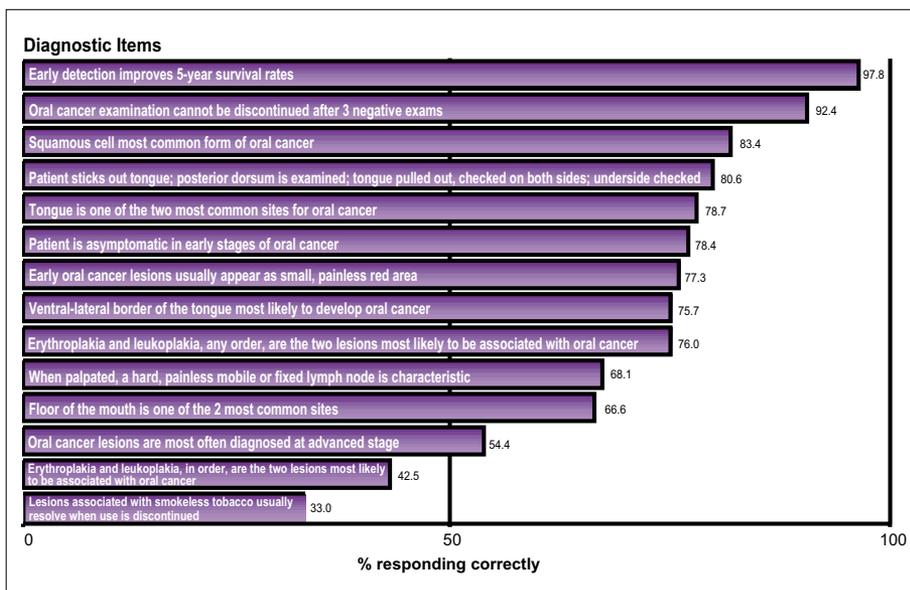
### Knowledge of Diagnostic Procedures for Oral Cancer

Two diagnostic procedures were correctly identified by most respondents (Fig. 2), that early detection improves the 5-year survival rate and that oral cancer examination should not be discontinued after 3 negative exams. The procedure for complete examination of the tongue, the fact that early oral cancer is asymptomatic, and the appearance of early oral cancer lesions were correctly identified by large numbers of respondents. Just over half knew that most oral cancer is diagnosed at an advanced stage. However, fewer than half recognized the 2 conditions (erythroplakia and leukoplakia, in that order) most likely to be associated with oral cancer.

Scores on the 14-item index of dentists’ knowledge of diagnostic procedures ranged from 0 to 14 (mean 10.0). For only one diagnostic item was the response significantly different between the provinces: a higher percentage of B.C. dentists correctly identified that lesions associated with smokeless tobacco generally resolve with discontinuation of such products ( $p < 0.001$ ). There were no statistically significant differences between the provinces in terms of mean diagnostic scores.



**Figure 1:** Percentage of dentists in British Columbia and Nova Scotia who provided correct responses to selected items about knowledge of risk factors for oral cancer and factors that have not been shown to pose any risk ("nonrisk")



**Figure 2:** Percentage of dentists in British Columbia and Nova Scotia who provided correct responses to selected items about knowledge of diagnostic procedures for oral cancer

### Patterns of Knowledge

Dentists were cross-classified on each of the 2 indices to determine their patterns of knowledge of risks and diagnostic procedures (Table 3). Nearly 39% of the dentists had consistent levels of knowledge on both indices. Of the dentists whose scores were inconsistent, about 33% had better knowledge of risk factors than diagnostic procedures,

and about 29% had better knowledge of diagnostic procedures than risk factors.

Although there was a statistically significant relationship between the 2 indices, the correlation was not strong (Pearson's  $r = 0.31$ ). This result confirms that risk factors and diagnostic procedures represent distinguishable areas of knowledge. One scale predicts less than 10% of the variance in the other.

### Dentists' Background Characteristics and Knowledge of Oral Cancer

Six background characteristics (sex, year of graduation, primary practice setting, timing of most recent continuing education course, belief that one's knowledge of oral cancer was current and number of patients seen per week) were explored in relationship to each of the 2 knowledge indices. Only year of graduation was significantly associated with the risk index ( $p < 0.001$ ). Both year of graduation and timing of most recent continuing education course were significantly associated with the diagnostic index ( $p < 0.001$ ).

### Currency of Knowledge and Adequacy of Undergraduate Education

Overall, 56.7% of the dentists agreed that their knowledge of oral cancer was current. A large proportion (32.1% in British Columbia and 29.8% in Nova Scotia) disagreed that their knowledge was current. More than three-quarters (77.0%) indicated an interest in taking continuing education courses.

### Discussion

Although the reported response rate for this survey was less than desirable, it was based on a conservative assessment of responses. Only dentists who stated that they were not in clinical practice at the time of the survey were omitted from the target population, whereas all surveys not returned, stamped "address unknown" or returned

**Table 3** Percentage distribution of dentists by patterns of knowledge about risks of and diagnostic procedures for oral cancer

Knowledge of risk factors <sup>a</sup>	Knowledge of diagnostic procedures <sup>b</sup>			All dentists
	Low score (0–9 items)	Medium score (10 or 11 items)	High score (12–14 items)	
Low score (0–8 items)	16.9	12.5	5.7	35.1
Medium score (9 or 10 items)	12.5	11.2	10.6	34.3
High score (11–16 items)	7.0	13.1	10.4	30.6
All dentists	35.4	36.9	26.7	100.0

<sup>a</sup>Total of 16 risk items<sup>b</sup>Total of 14 diagnostic items

unopened were included in the calculation. Nonetheless, the response rate was higher than for the U.S. study (50%)<sup>19</sup> and the Maryland study (54%).<sup>17</sup> Although the results, based on unweighted data, cannot be generalized to all dentists in British Columbia or to other provinces, the results for Nova Scotia represent the population of dentists in that province. The results probably reflect higher levels of knowledge about oral cancer and higher levels of interest in continuing education courses on this subject among responding dentists than among all dentists.

The dentists responding to this survey knew most of the real risk factors for oral cancer, particularly use of tobacco and alcohol, although less than half knew that most cases of oral cancer are diagnosed in people 60 years of age or older. Dentists were much less certain about factors that do not pose a risk. The smaller proportions of dentists who correctly reported factors such as poor oral hygiene and a family history of cancer as not posing a risk indicate a relatively high level of misinformation among these practitioners (Fig. 1).

Similarly, dentists' knowledge of diagnostic procedures indicates specific areas of misinformation or lack of information. Although almost 80% knew that the tongue is one of the 2 most common sites of oral cancer and two-thirds knew that the floor of the mouth is the other most common site, only 56% identified both sites. Nearly everyone understood that early detection improves 5-year survival rates, but only about half knew that most oral cancer is diagnosed at a late stage. Finally, although current evidence clearly shows that red lesions or red and white mixed lesions are most likely associated with oral cancers,<sup>8</sup> only 42.5% correctly identified erythroplakia and leukoplakia, in that order, as the 2 lesions most likely to be associated with these cancers.

The highly significant relationship between high scores on both indices and year of graduation may reflect increasing attention to oral cancer in the undergraduate curriculum in more recent years. Similarly, the highly significant relationship between high scores on the diagnostic index and a recent continuing education course affirms the positive effect of such activities. Although these are clear indi-

cations of the benefits of recent education, the large proportion of dentists who had low or medium scores on one or both indices (53.1%; see Table 3) demonstrates a conspicuous need for further educational interventions regarding both risk factors and diagnostic procedures. Overall, the pattern of correct identification of real risk factors, nonrisk factors and diagnostic procedures was nearly identical with that found in the survey of U.S. dentists.<sup>19</sup>

Although 56.7% of dentists agreed that their knowledge was current, nearly one-third disagreed, which suggests that many dentists are aware of their lack of knowledge and are not confident about their knowledge and practices. These findings concerning dentists' knowledge and opinions related to oral and pharyngeal cancer suggest strongly that educational interventions for practitioners and dental students are necessary. Current undergraduate curricula and continuing education for graduates might effectively address the gaps identified in these findings through a range of educational strategies. Practitioners must have current knowledge of risk factors for oral cancer, the factors that do not pose any risk, and diagnostic procedures to assess patient health, to enable them to provide oral cancer examination and to assist patients in reducing their risk through tobacco cessation counselling and other patient education. As these results are not generalizable to other regions, it may be expedient to determine levels of knowledge regarding oral cancer risks and diagnostic procedures in other provinces and territories.

## Conclusions

Although this survey demonstrated gaps in dentists' knowledge about oral cancer, it also demonstrated their understanding of their needs in this area and a willingness to undertake additional education. We caution, however, that the survey results are probably better than would be the case for nonresponding dentists.

In addition to their role in the prevention and early detection of oral cancer, dentists are instrumental in providing health education to patients and the community. Dentists share, with other health care providers, responsibility for closing the gap between public knowledge and

public behaviour by using and disseminating scientific findings. Effective health education and health promotion strategies for both health care professionals and the public are requisite to the transfer of scientific knowledge.<sup>23</sup>

The morbidity and mortality associated with oral and pharyngeal cancers is a significant social burden even though, when diagnosed at an early stage, such cancers can be successfully treated. Relative to the other 2 more prominent oral diseases, dental caries and periodontal disease, oral cancer receives less attention in both the public and oral health professional domains. The crucial role of dentists in reducing the individual and social burden associated with oral cancer requires appropriate knowledge and practices. Intentional and appropriately designed educational interventions can enhance practitioner knowledge and practice in this area. ♦

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## References

1. National Cancer Institute of Canada. Canadian cancer statistics 2000. Toronto, Canada: National Cancer Institute of Canada; 2000. p. 13-22.
2. Silverman S Jr. Demographics and occurrence of oral and pharyngeal cancers. The outcomes, the trends, the challenge. *J Am Dent Assoc* 2001; 132 Suppl:7S-11S.
3. Mashberg A, Garfinkel MA. Early diagnosis of oral cancer: the erythroplastic lesion in high-risk sites. *CA Cancer J Clin* 1978; 28(5):297-303.
4. Greenlee RT, Hill-Harmon M, Murray T, Thun M. Cancer statistics, 2001. *CA Cancer J Clin* 2001; 51(1):15-36.
5. Rosati C. Prevention of oral cancer. In: Rosati C, The Canadian guide to clinical preventive health care. Ottawa: Minister of Supply and Services Canada; 1994. p. 839-47.
6. Rowe D, Gallagher RP, Warshawski L, Carruthers A. Females vastly outnumber males in basal cell carcinoma of the upper lip. A peculiar subset of high risk young females is described. *J Dermatol Surg Oncol* 1994; 20(11):754-6.
7. Horowitz AM, Alfano, MC. Perform a death-defying act. *J Am Dent Assoc* 2001; 132 Suppl:5S-6S.
8. Sciubba JJ. Oral cancer and its detection. History-taking and the diagnostic phase of management. *J Am Dent Assoc* 2001; 132 Suppl:12S-18S.

9. Alfano, MC, Horowitz AM. Professional and community efforts to prevent morbidity and mortality from oral cancer. *J Am Dent Assoc* 2001; 132 Suppl:24S-29S.
10. Perform a death-defying act. The 90-second oral cancer examination. *J Am Dent Assoc* 2001; 132 Suppl:36S-40S.
11. 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(6):319-30.
12. Meskin LH. Oral cancer — the forgotten issue. *J Am Dent Assoc* 1994; 125(8):1042-5.
13. Amsel Z, Strawitz JG, Engstrom PF. The dentist as a referral source of first episode head and neck cancer patients. *J Am Dent Assoc* 1983; 106(2):195-7.
14. Axell T. The professional role of the dentist under the aspects of precancer and cancer diagnosis and management. *Int Dent J* 1993; 43(6):609-11.
15. Fedele DJ, Jones JA, Niessen LC. Oral cancer screening in the elderly. *J Am Geriatr Soc* 1991; 39(9):920-5.
16. Leong IT, Main JH, Birt BD. Cancer of the tongue. *J Can Dent Assoc* 1995; 61(9):792-6.
17. Horowitz AM, Drury TF, Canto MT. Practices of Maryland dentists: oral cancer prevention and early detection - baseline data from 1995. *Oral Dis* 2000; 6(5):282-8.
18. 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(4):453-62.
19. Yellowitz JA, Horowitz AM, Drury TF, Goodman HS. Survey of U.S. dentists' knowledge and opinions about oral pharyngeal cancer. *J Am Dent Assoc* 2000; 131(5):653-61.
20. Aday LA. Designing and conducting health surveys. San Francisco: Jossey-Bass Publishers; 1996.
21. Dillman DA. Mail and other self-administered questionnaires. In: Rossi PH, Wright JD, Anderson AB, editors. Handbook of survey research. New York: Academic Press, Inc.; 1983.
22. Fink A. The survey kit. Thousand Oaks: SAGE Publications, Inc.; 1995.
23. Horowitz AM. The public's oral health: the gaps between what we know and what we practice. *Adv Dent Res* 1995; 9(2):91-5.