Smoking and Oral Health Status

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ABSTRACT

Clinical studies suggest that smokers have a higher than average risk of periodontal disease and poor oral health status. In 2003, the Canadian Community Health Survey — a multistage, nationwide household survey — asked a series of questions related to oral health status. This report is based on the population aged 18 and older who answered the optional module on oral health (33,777 respondents). This subsample represents a weighted population of 23.9 million. The overall survey response rate was 80.6%.

In our sample, 24% of respondents were current cigarette smokers, 43% were former smokers and 33% had never smoked. The prevalence of current smoking declined with advancing age and was inversely associated with household income and level of education.

The prevalence of edentulism was 15% among current smokers compared with 7% among those who had never smoked. In the dentate population, current smokers were less likely to have visited a dentist in the past 3 years and more likely to report sensitivity of teeth, tooth ache in the previous month, pain in the mouth or face and social limitations because of teeth. When age, sex, household income and dental insurance were controlled in a multivariate logistic regression model, current smokers and former smokers had higher odds of reporting oral–facial pain than people who had never smoked. Prevention of smoking onset and support for cessation of smoking could contribute to improved oral health status.

MeSH Key Words: health surveys; oral health; smoking/adverse effects

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Smoking has been identified as a major risk factor for lung cancer, heart disease, peripheral vascular disease and respiratory disease. A number of clinical studies and regional health surveys have found an association between smoking and poor oral health.[1,2] However, there is a scarcity of national data on that relation as only a few national surveys have asked questions about dental health and those questions have been limited. In addition, no previous national survey has asked questions related to the broader concept of oral health. Oral health is defined by the Canadian Dental Association as "a state of the oral and related tissues and structures that contributes positively to physical, mental and social well-being and to the enjoyment of life's possibilities, by allowing the individual to speak, eat and socialize unhindered by pain, discomfort or embarrassment."[3]

In 2003, the Canadian Community Health Survey (CCHS)[4] asked a series of questions about the oral health of the population. This article compares the oral health of current smokers, former smokers and those who have never smoked among people aged 18 years and older to assess the association between smoking and compromised oral health status.

Definitions and Methods

The data are from cycle 2.1 of Statistics Canada's CCHS, which covers the noninstitutionalized household population aged 12 or older in all provinces and territories, with the exception of people living on reserves, on Canadian Forces bases and in some remote areas. Data were collected between January and December 2003. The overall response rate was 80.6%, and the sample size was 135,573. In this study, we examine the oral health status of the population aged 18 or older who answered the optional module on oral health (33,777 respondents). This sample represents a weighted population of 23.9 million. The main focus of the analysis is on the dentate members of this population (28,265 people, representing a weighted population of 21 million). More detail about the design of the CCHS is available in a previously published report.[5] Supplementary information related to the use of nonsmoked tobacco was obtained from the 2000 CCHS.[6]

To account for the multistage sample design of the survey, a weighted bootstrap resampling procedure was used to calculate coefficients of variation for totals and rates. This technique also allowed estimation of standard errors and calculation of confidence intervals for the odds ratios.[7–10] A significance level of $p < 0.05$ was applied in all cases. The distribution of the 2003 population aged 18 and older (both sexes) was used as the reference population for direct standardization of rates. The population examined in this article is the household population aged 18 or older in the provinces and territories.

Definitions

Dental Consultations

To measure dental consultations, CCHS respondents were asked: "In the past 12 months, how many times have you seen or talked on the telephone about your physical, emotional or mental health with a dentist or orthodontist?"

Infrequent Use of Dental Services

Respondents reported their usual frequency of dental visits. Response options were: more than once a year for checkups, about once a year for checkups, less than once a year and only for emergency care. Respondents who visited less than once a year or who visited only for emergency care were classified as "infrequent."

Edentulism

One measure of dental status is the proportion of the population that is edentate (i.e., have no natural teeth). Respondents who indicated that they did not have at least 1 natural tooth were classified as edentate.

Dentures

Respondents were asked if they wore "dentures or false teeth."

Self-Perceived Oral Health

Respondents were asked to report on the general health of their teeth and mouth. Response options were excellent, very good, good, fair and poor. For our analysis, we combined these responses into 3 categories: excellent/very good, good and fair/poor.

Oral–Facial Pain

To measure pain and discomfort associated with oral health, respondents were asked a series of questions about their oral health in the past month. Questions related to the presence of toothache, tooth sensitivity to cold or hot food or drinks, pain in jaw joints and pain in the mouth or face. Responses were combined into a derived variable that summarized pain or discomfort related to oral health.

Impact of Oral Health on Social Function

To determine whether respondents' oral health affected their social functioning, they were asked whether in the past 12 months they had avoided conversation or contact with other people because of the condition of their teeth, mouth or dentures or whether they had avoided laughing or smiling because of the condition of their teeth, mouth or dentures. Those who answered yes to either question were classified as "limited socially" due to their oral health.

Ability to Chew

Respondents were asked a series of questions related to their ability to chew different foods, including "Can you chew firm foods (e.g., meat)?" and "Can you bite off and chew a piece of fresh apple?" Those answering no to either question were classified as having "limited chewing ability."

Dental Insurance

All respondents were asked whether they had insurance that covered all or part of their dental expenses. Respondents who answered yes were classified as having dental insurance.

Smoking Behaviour

Those who stated that they smoked daily or occasionally were defined as "current smokers." "Former smokers" are those who used to smoke daily or occasionally but do not currently smoke. The "never smoked" category consists of those who indicated that they had never smoked cigarettes.

Results

Prevalence of Smoking

Table 1 shows the prevalence of smoking by selected demographic characteristics of the population aged 18 years and older. About 1 in 4 adults was a current

Table 1 Prevalence of smoking by age, sex and household income in the population aged 18 years and older, Canada including territories 2003

Demographic characteristic	Sample size	Population represented; 000s	Type of smoker		
			Current smoker (%)	Former smoker (%)	Never smoked (%)
Age group; years					
Both sexes	33,777	23,851	24	43	33
18–34	8,710	7,023	30	31	39
35–44	5,924	5,277	30	39	32
35–54	6,067	4,584	24	50	26
55–64	5,340	3,221	19	55	26
65+	7,736	3,747	11	54	35
Males	15,225	11,687	26	48	26
18–34	3,983	3,532	33	30	37
35–44	2,951	2,647	32	40	29
35–54	2,826	2,248	26	52	22
55–64	2,434	1,622	19	64	17
65+	3,031	1,639	11	71	17
Females	18,552	12,164	23	39	38
18–34	4,727	3,491	28	31	41
35–44	2,973	2,630	28	38	34
35–54	3,241	2,336	22	48	31
55–64	2,906	1,599	18	46	36
65+	4,705	2,108	11	41	48
Household income level					
Low	3,817	1,882	35	34	31
Lower middle	6,576	4,004	30	39	32
Upper middle	10,093	7,140	26	43	31
High	8,471	7,394	19	49	32
Missing	4,820	3,432	22	41	37
Level of education					
Less than high school	8,460	4,559	38	36	26
High school	6,070	4,545	28	40	32
Some postsecondary	2,541	1,952	26	45	29
College/university	16,136	12,263	19	46	34
Missing	570	533	26	43	32
Dental insurance					
Yes	18,455	13,905	23	46	32
No	14,300	9,213	27	40	33

Source: Canadian Community Health Survey, Cycle 2.1, 2003.[4]
Note: Rows may not add up to 100% due to rounding. The summary rates for sex, household income, level of education and dental insurance are age-adjusted.

cigarette smoker. The prevalence of smoking declined with age from 30% among those under 45 years of age to 11% in the 65 years and older group. Smoking rates were higher among males than females, and rates were inversely associated with household income and education. Among those in the lowest household income group, 35% were current smokers compared with 19% in the high-income group. Thirty-eight percent of people with less than high school education smoked compared with 19% of those with college or university education. People

Table 2 Prevalence of edentulism in the population aged 18 years and older, by age, sex and smoking status, Canada including territories 2003

Demographic characteristic	Total		Current smoker		Former smoker		Never smoked	
	000s	%	000s	%	000s	%	000s	%
Sex								
Both sexes	23,237	10	5,627	15[a]	9,990	9[a]	7,473	7
Males	11,330	8	2,966	14[a]	5,293	9[a]	3,006	5
Females	11,906	11	2,661	17[a]	4,698	11[a]	4,467	8
Age group; years								
18–34	6,963	1	2,107	—[b]	2,145	—	2,679	—
35–44	5,217	3	1,524	4	2,030	2	1,635	2
45–54	4,528	7	1,055	14[a]	2,254	5[a]	1,181	3
55–64	3,106	17	570	30[a]	1,722	17[a]	798	10
65+	3,423	33	372	48[a]	1,840	33[a]	1,179	30
Household income level								
Low	1,819	18	611	23[a]	638	16[a]	567	13
Lower middle	3,836	13	1,073	18[a]	1,535	12[a]	1,221	10
Upper middle	6,964	9	1,813	15[a]	2,980	9[a]	2,164	6
High	7,238	5	1,450	9[a]	3,496	5	2,284	3
Level of education								
Less than high school	4,287	17	1,261	23[a]	1,784	15[a]	1,197	13
High school	4,411	9	1,276	12[a]	1,740	9	1,378	6
Some postsecondary	1,938	7	557	16[a]	761	6[a]	613	4
College/university	12,116	6	2,419	10[a]	5,482	6[a]	4,142	5
Dental insurance								
Yes	13,889	7	3,306	14[a]	6,088	7[a]	4,423	5
No	9,138	12	2,267	17[a]	3,838	12[a]	2,964	9

Source: Canadian Community Health Survey, Cycle 2.1, 2003.[4]
Note: Smoker categories will not add up to total population because of a missing category that is not shown. Summary rates are adjusted to the population of Canada, both sexes, 2003.
[a]*Edentate rate of current smokers and former smokers is significantly different from that of never smoked group,* $p < 0.05$.
[b]*Coefficient of variation exceeds 33%.*

without dental insurance were more likely to be current smokers.

Smoking and Edentate Status

Table 2 shows the proportion of the population aged 18 or older who were edentate by selected demographic characteristics and smoking status. In the total population, 10% of the population was edentate and edentate rates were higher among females (11%) than males (8%). Edentulism rates rose with advancing age, from 1% in the 18–34 year old age group to 33% in the 65 years and older group. As expected, edentulism rates were influenced by socioeconomic factors. Among those with low income, 18% were edentate compared with 5% of those in high-income households. Among people with less than high school education, the prevalence of edentulism was 17% compared with 6% among those with a college diploma or university degree.

Compared with people who never smoked, current smokers were more likely to be edentate. After age 44, in all age groups, current smokers had higher rates of edentulism compared with people who had never smoked. For people aged 65 years or older, the rate of edentulism among current smokers was 48% compared with 30% among those who had never smoked. In terms of household income, current smokers in all income groups had higher rates of edentulism than their counterparts in the never smoked group. A similar pattern applied within educational categories.

Table 3 Age-adjusted rates of selected indictors of oral health in the dentate population aged 18 years and older, Canada including the territories 2003

Indicator of oral health	Type of smoker		
	Current smoker (%)	Former smoker (%)	Never smoked (%)
Preventive care			
Dental visit in past year	58[a]	73	70
No dental consult in past 3 years	37[a]	25	24
Brush teeth once a day	18[a]	17	14
Brush teeth twice a day	55	54	55
Brush teeth more than twice a day	24[a]	27	29
Oral health			
Bleeding gums in past month	10	13	12
Teeth sensitive to hot or cold in past month	31[a]	29	27
Toothache in past month	15[a]	11	10
Pain in jaw joints in past month	11	8	8
Pain in mouth or face in past month	20[a]	17	16
Denture use	24[a]	19	15
Social limitation because of teeth	6[a]	3	3
Limited chewing ability	7	6	6
Dry mouth	15[a]	10	10
Bad breath in past month	19[a]	15	12
Access to care			
Dental health insurance	58[a]	66	63
Perceived health of teeth and mouth			
Excellent/very good	44[a]	57	60
Good	32[a]	29	29
Fair/poor	24[a]	14	11

Source: Canadian Community Health Survey, Cycle 2.1, 2003.[4]
[a]Difference between rate for current smokers and never smoked is statistically significant, $p < 0.05$.

Smoking and Preventive Care

Table 3 shows age-adjusted rates for selected indicators of oral health in the dentate population aged 18 or older. Current smokers were least likely to use dental services. Only 58% of current smokers consulted a dentist in the past year compared with 70% of those who had never smoked, and the proportion of the population who had not consulted a dentist in the past 3 years was higher among current smokers (37%) than among those who never smoked (24%). Current smokers were also less likely to exercise daily preventive care. About 18% of current smokers indicated that they brush their teeth only once a day compared with 14% of never smokers; 24% brush their teeth more than twice a day compared with 29% of never smokers.

Oral Health Problems

In light of the lower dental consultation rates and lower rates of daily preventive care, it is not surprising that current smokers were more likely to report oral health problems. Compared with people who had never smoked, current smokers were more likely to report sensitivity of teeth to hot or cold, toothache and pain in the mouth or face in the preceding month. Current smokers were also more likely to report denture use and social limitations because of their teeth. The proportion of respondents who reported that their oral health is excellent/very good was lower among current smokers (44%) than those who had never smoked (60%).

As noted previously, age, sex, household income, access to dental care and smoking can all exercise independent

Table 4 Prevalence of oral–facial pain and adjusted odds ratios in the dentate population aged 18 years and older by selected characteristics, Canada including territories 2003a

Demographic characteristic	Total population		Oral–facial pain (%)	Adjusted odds ratio	95% confidence interval
	Sample size	Population represented; 000s			
Total	**28,296**	**21,030**	**37**	—[b]	—
Sex					
Males[c]	13,036	10,426	33[d]	**1.00**	—
Females	15,260	10 605	41[d]	1.48[e]	1.34–1.63
Age group; years				0.98[f]	0.978–0.984
18–34	8,548	6,885	44[d]	—	—
35–44	5,688	5,068	39[d]	—	—
45–54	5,467	4,225	34[d]	—	—
55–64	4,164	2,564	30[d]	—	—
65+	4,429	2,288	23[d]	—	—
Type of smoker					
Current smoker	7,200	5,058	42[d]	1.34[e]	1.18–1.52
Former smoker	12,239	8,899	35[d]	1.17[e]	1.05–1.31
Never smoked[c]	8,717	6,943	35[d]	**1.00**	—
Household income level					
Low	2,665	1,462	44[d]	1.29[e]	1.05–1.58
Lower middle	4,945	3,238	39[d]	1.18[e]	1.02–1.38
Upper middle	8,882	6,384	36	1.02	0.90–1.15
High[c]	7,960	6,983	36	**1.00**	—
Missing	3,844	2,963	35	1.06	0.91–1.24
Level of education					
Less than high school	5,414	3,181	36	1.04	0.90–1.18
High school	5,304	4,081	36	0.92	0.82–1.03
Some postsecondary	2,329	1,850	46[d]	1.24[e]	1.05–1.47
College/university	14,847	11,505	36	**1.00**	—
Dental insurance					
Yes[c]	16,981	13,075	37	**1.00**	—
No	11,061	7,772	36	0.99	0.89–1.09

Source: Canadian Community Health Survey, Cycle 2.1, 2003.[4]
[a]*Based on 27,520 of 28,296 records.*
[b]*Not applicable.*
[c]*Reference category.*
[d]*Significantly different from value for total* ($p < 0.05$).
[e]*Significantly different from reference category.*
[f]*Treated as a continuous variable.*

effects on oral health status. **Table 4** considers the summary measure of oral–facial pain using multivariate logistic regression. In the total dentate population, 37% indicated that they experienced oral–facial pain in the previous month. The rate among women (41%) was higher than the national average, while the rate for men (33%) was lower. In general, the rate of oral–facial pain declined with advancing age after age 35 years. Only people aged 18–34 had a rate (44%) that exceeded the national average. The rate among current smokers (42%) was higher than the national average, whereas the rate among former smokers and those who have never smoked (35%) was lower than the national norm. The prevalence of oral–facial pain was higher than the national average among low and lower-middle income groups. In a multivariate logistic model that controlled for sex, age, household income,

education and dental insurance, current smokers and former smokers had higher odds of oral–facial pain than those who had never smoked.

Discussion

There are a number of limitations in the present study. Because the survey is a cross-sectional sample, it is not possible to make causal inferences about the association between smoking and oral health. In addition, the data relating to oral health were self-reported rather than observed. Ideally, oral health indicators should be based on standardized clinical measurements.

The focus of this paper is on smoking, but both smoked and nonsmoked tobacco are associated with oral cancer.[11] Earlier data from the 1986 Labour Force Survey smoking supplement indicated that the use of smokeless tobacco products is confined to the male population.[12] About 0.7% of males over age 15 used chewing tobacco and 0.4% used snuff. Prevalence rates for both substances tend to be higher in older age groups. Men employed in outdoor occupations were more likely to use chewing tobacco or snuff.[12] Data from the 2000 CCHS[6] suggest that about 1% of males age 15 or older use snuff or chewing tobacco.

In this study, smokers were less likely to consult a dentist during the past year, and less likely to have seen a dentist in the past 3 years. Various studies have shown that socioeconomic and cultural factors influence health behaviour through exposure to various physical and social environments.[13,14] Lack of use of preventive care may reflect a general attitude toward preventive care, differences in willingness or ability to pay for dental services or differences in the availability of dental care.

The hypothesis that current or former smokers would manifest a higher prevalence of oral health problems than those who have never smoked was supported for most of the indicators used in this study. These findings are consistent with previous clinical research that suggests that smoking is associated with both the prevalence and severity of periodontal disease.[1,15,16] In an analysis of the effect of smoking on overall periodontal disease rates in the United States, it was estimated that 41.9% of periodontitis cases were attributable to current smoking and 10.9% were attributable to former smoking.[17] A recent longitudinal analysis of smoking and oral pain indicated that smokers are at increased risk of oral pain but, when they stop smoking, the risk of pain decreases significantly.[18] These finding reinforce the view that avoidance or cessation of smoking may result in substantial improvements in oral health status.

The prevalence of cigarette smoking has been declining in Canada. In 1966, 53% of males and 32% of females aged 15 or older were daily cigarette smokers.[19] By 2003, this proportion had declined to 20% of males and 17% of females. The decline is attributable to broad population-based policies and programs directed at the prevention of smoking and cessation of smoking.

Although the approach to tobacco control differs among territories and provinces, the advertising and marketing of smoking has been greatly restricted; smoking has been banned in many workplace and public settings; and youth access to smoking is restricted in most provinces by both federal and provincial legislation. A variety of smoking cessation programs have been developed through private and public organizations, and pharmaceutical aids and behavioural programs for smoking cessation have been developed and marketed.[20]

These changes in the social, economic and political context of smoking behaviour are potentially supportive of initiatives by dental practitioners. A number of researchers have argued that dentists have an important role to play in tobacco control.[21–23] Brief smoking cessation advice and supportive materials in the context of regular oral health visits can lead to higher smoking cessation rates.[24] Support of community-based efforts to control tobacco and active engagement in the tobacco control debate also contribute to the momentum toward smoking cessation.[25]

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