

Risk Factors for Cancer of the Tongue and the Mouth

A Case-Control Study from Northern Italy

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Background. The role of tobacco and alcohol consumption and the frequency of intake of a selected number of indicator foods as causes of cancer were investigated in a case-control study conducted in northern Italy.

Methods. One hundred two men with cancer of the tongue, 104 patients with cancer of the mouth, and 726 control subjects (the latter admitted to the hospital for acute nonneoplastic disease without respiratory illness) were interviewed.

Results. Similarly strong associations were observed with cigarette smoking (odds ratio [OR], 10.5 and 11.8 for current smokers versus never smokers in cancer of the tongue and mouth, respectively) and alcohol (OR, 3.4 and 3.0 for ≥ 60 versus ≤ 19 drinks/week). The risk conferred by pipe or cigar smoking, although based on only 12 smokers who did not smoke cigarettes, seemed, however, to be lower for cancer of the tongue (OR, 3.4) than cancer of the mouth (OR, 21.9). Selected indicator foods and beverages, including green vegetables, carrots, fresh fruits, whole-grain bread and pasta, coffee, and tea also affected the cancer risk similarly in the two sites. The beneficial influence of such foods and beverages seemed, however, to be more marked for cancer of the mouth than for cancer of the tongue.

Conclusions. This study suggested that, although none of the differences in the effects between cancer sites was statistically significant, tobacco from pipes and cigars and the cleansing effect of some foods of plant origin

and nonalcoholic beverages may influence the risk of cancer of the tongue less strongly than the risk of cancer of the mouth. *Cancer* 1992; 70:2227-2233.

Key words: cancer of the tongue, cancer of the mouth, tobacco, alcohol, diet.

Determining the exact origin of tumors of the oral cavity often is difficult because tumors commonly spread over recognized anatomic boundaries.¹ Therefore, relatively few epidemiologic studies have made reliable differentiations in causes for various structures of the oral cavity (e.g., tongue, gum, and floor of the mouth). The geographic pattern, sex ratios, and temporal trends of cancer of the mouth closely resemble those of cancer of the tongue. However, unlike cancer of the tongue, cancer of the mouth is associated strongly with rural residence.²

In Western countries, tobacco and alcohol are the two best known risk factors for cancers of the tongue and the mouth,³⁻¹⁴ although dietary habits also have been associated.¹⁵⁻¹⁸ Attempts to conduct case-control studies on the causes of different cancer sites in the oral cavity have been rare,^{3,7,14,15,19} and cancer of the tongue, in particular, generally is considered together with other parts of the oral cavity.

We evaluated the general epidemiology and potential differences in risk factors between cancer of the tongue and cancers that arise in other sites of the oral cavity (the mouth) with special reference to smoking and drinking habits and dietary factors. For this purpose, we took advantage of a case-control surveillance program that has been ongoing since 1986 in the northern part of Italy.

Materials and Methods

Histologically confirmed cases of cancer of the tongue in men (International Classification of Diseases, 9th

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edition, code 141) and of other sites of the oral cavity (the floor of the mouth, gum, and retromolar trigone; codes 143, 144, 145, and 149; subsequently referred to as cancer of the mouth) constituted the patient group. Cancers of the lip, salivary gland, and oropharynx were excluded. Eligible patients were required: (1) to be younger than age 75 years, (2) to have their disease diagnosed within 6 months before the date of the interview, and 3) to be permanent residents in the two study areas (i.e., the western part of the Friuli-Venezia Giulia region [Pordenone province] and the greater Milan area, in the Lombardy region). All data were collected between January 1986 and December 1990. Because these two areas are not covered by cancer registries, it was not possible to estimate the proportion of patients with cancer interviewed in relation to the total incidence rate. The hospitals under study, however, included most of the diagnostic and therapeutic facilities available, and therefore, the highest number of cases should have been referred there. Overall, 102 patients with cancer of the tongue (median age, 58 years) and 104 with cancer of the mouth (median age, 59 years) were interviewed. Compared with the greater Milan area, the excess of those with cancer of the tongue in the Pordenone province was highly significant (Table 1).

Male patients who were admitted to the same hospitals for acute illnesses were eligible to be control subjects. None of these patients had malignant tumors, any condition related to tobacco or alcohol consumption, or diseases that might have resulted in dietary modifications. Other criteria for inclusion were the same as for the patient group. A total of 726 control subjects (median age, 57 years) were interviewed (Table 1). Of these, 25% were admitted to the hospital for traumatic orthopedic conditions (mainly fractures and sprains), 19% for infections and acute surgical conditions, 18% for eye disorders, 14% for skin diseases, and 20% for other illnesses (e.g., aural, nasal, or dental disorders). All patients were interviewed during the course of their hospitalization. No next-of-kin respondents were used. The incidence rate of refusal to interview was approximately 2% for patients and 3% for control subjects.

Interviewers were trained to reduce the variability between study areas using the same precoded structured questionnaire that included smoking, alcohol consumption, dietary habits, and personal history of selected medical conditions. In particular, a man was defined as a pipe or cigar smoker if he was not, at the same time, a regular cigarette smoker. In regard to alcohol intake (considering different alcohol concentrations), one drink corresponded to 150 ml of wine, 330 ml of beer, or 30 ml of hard liquor.

The part of the dietary questionnaire, common to the two study areas, included 14 indicator foods (major sources of proteins, fats, vitamins, and fibers in the Ital-

Table 1. Distribution of 102 Patients With Cancer of the Tongue, 104 Patients With Cancer of the Mouth, and 726 Control Subjects According to Age

Characteristic	Control subjects		Patients with cancer of the tongue		Patients with cancer of the mouth	
	No.	Percent	No.	Percent	No.	Percent
Age (yr)						
≤ 49	200	28	24	24	20	19
50-54	98	13	14	14	16	15
55-59	119	16	17	17	22	21
60-64	157	22	20	20	21	20
≥ 65	152	21	27	26	25	24
Education (yr)						
≥ 4	114	16	22	22	22	21
5-7	366	50	62	61	65	63
≥ 8	246	34	17†	17	17†	16
Occupation						
Clerical/professional	240	33	18	18	27	26
Manual worker	403	56	61	60	56	54
Farmer	80	11	22†	22	21†	20
Marital status						
Never married	60	8	18	18	14	14
Ever married	666	92	84†	82	90	87
Study area						
Pordenone province	507	70	72	71	53	51
Greater Milan area	219	30	30	29	51‡	49

* Total sample size varies with the number of patients and control subjects with incomplete information.

† When compared with the control group, the difference was significant ($P \leq 0.05$).

‡ The difference in the distribution according to cancer site in the two areas of residence was highly significant ($P \leq 0.01$).

ian diet^{20,21}) and 4 nonalcoholic beverages. All information on diet referred to the frequency of consumption per week of the selected food items 1 year before the onset of the disease that led to the hospital admission. Any substantial change in the consumption of these same foods during the 10-year period preceding diagnosis also was elicited. Changes in diet, however, were infrequent, and in no instance, were there appreciable differences between patients and control subjects. Therefore, for analytic purposes, we considered only information on recent diet. Frequencies of consumption of various foods and beverages were subdivided into three levels (low, intermediate, and high). Each included, as far as possible, the same number of patients and control subjects combined (approximate tertiles). Simple subjective scores (low, intermediate, or high) were used as measures of intake of whole-grain bread and pasta and of fats in condiments (butter, margarine, and oil).

The odds ratios [OR] and their 95% approximate confidence intervals [CI]²² were calculated by means of unconditional multiple-logistic regression²³ that considered the study design variables (age and area of resi-

dence), potential confounders (occupation in three strata, i.e., professional and clerical, manual workers, and farmers), and the potential confounding effect of tobacco smoking and alcohol drinking (using three levels, < 35 drinks, 35–59, and \geq 60 drinks per week). In regard to smoking, four categories were defined: (1) nonsmokers; (2) light exsmokers who quit 10 years or more ago or smokers of 1–14 cigarettes/day for less than 30 years; (3) intermediate smokers of 15–24 cigarettes/day regardless of duration, 30–39 years' duration regardless of amount, 1–24 cigarettes/day for 40 years or more, or 15 or more cigarettes/day for less than 30 years; and (4) heavy smokers of 25 or more cigarettes/day for 40 years or more.

Results

Table 1 shows the distribution of patients and control subjects according to age and other sociodemographic

characteristics. Control subjects were more educated than both patient groups; patients were more frequently farmers compared with control subjects. Moreover, patients with cancer tended to be unmarried.

In Table 2, the OR associated with tobacco smoking are presented. Few patients described themselves as lifelong nonsmokers. The only apparent difference between patients with cancer of the tongue and those with cancer of the mouth was found in the type of tobacco smoked habitually. The adjusted OR for smokers of pipes or cigars were 3.4 (95% CI, 0.3–39.1) for cancer of the tongue and 21.9 (95% CI, 3.8–125.6) for cancer of the mouth. Conversely, OR for cigarette smokers were similar (10.5 [95% CI, 3.2–34.1] and 11.8 [95% CI, 3.6–38.4], respectively). Smoking-related risks increased significantly with increasing number of cigarettes and duration of smoking habit for both cancer sites. An early age at starting smoking led to an OR of 7.6 (95% CI, 2.3–25.0) for cancer of the tongue and 11.0

Table 2. Distribution of 102 Patients With Cancer of the Tongue, 104 Patients With Cancer of the Mouth, and 726 Control Subjects According to Smoking Habits (Northern Italy 1986–1990)*

Smoking habit	No. of control subjects	Patients with cancer of the tongue		Patients with cancer of the mouth	
		No.	Odds ratio† (95% confidence interval)	No.	Odds ratio† (95% confidence interval)
Never smoked	153	3	1‡	3	1‡
Cigar or pipe smoker only	6	1	3.4 (0.3–39.1)	5	21.9 (3.8–125.6)
Exsmoker	260	15	2.1 (0.6–7.7)	18	3.6 (1.0–12.6)
Current cigarette smoker	306	83	10.5 (3.2–34.1)	78	11.8 (3.6–38.4)
No. of cigarettes/day					
\leq 14	206	15	2.9 (0.8–10.2)	18	4.5 (1.3–15.8)
15–24	229	52	9.0 (2.7–29.8)	51	11.0 (3.3–36.4)
\geq 25	125	29	9.8 (2.8–33.6)	26	9.6 (2.8–33.1)
Chi-square trend			19.2§		17.9§
Duration of smoking (yr)					
\leq 29	229	24	3.7 (1.1–12.8)	17	3.5 (1.0–12.3)
30–39	157	29	7.7 (2.3–26.2)	36	11.0 (3.2–36.3)
\geq 40	174	43	12.4 (3.6–43.3)	41	14.3 (4.1–49.6)
Chi-square trend			17.7§		32.4§
Age started smoking (yr)					
\geq 20	280	45	6.3 (1.9–20.9)	40	6.5 (2.0–21.8)
\leq 19	282	54	7.6 (2.3–25.0)	59	11.0 (3.3–36.4)
Chi-square trend			7.3§		25.3§
Tar yield					
Low tar (< 22 mg)	364	49	5.8 (1.8–19.1)	53	7.1 (2.2–23.3)
High tar (\geq 22 mg)	185	45	9.8 (2.9–33.1)	42	14.4 (4.2–49.5)
Chi-square trend			18.5§		12.8§
Years since quitting (exsmokers only)					
\geq 10	138	3	0.7 (0.1–3.8)	3	0.7 (0.1–3.9)
< 10	122	12	3.8 (1.0–14.5)	13	3.8 (1.0–14.4)
Chi-square trend			6.7§		7.1§

* Total sample size varies with the number of patients and control subjects with incomplete information.

† Estimates from logistic regression adjusted for age, area of residence, occupation, and alcohol drinking habits.

‡ Reference category.

§ $P \leq 0.01$.

(95% CI, 3.3–36.4) for cancer of the mouth. Among exsmokers, those who had quit smoking for more than 10 years showed OR close to unity (0.7 for both cancer of the tongue and the mouth, Table 2).

Smokers of high-tar cigarettes had a 10-fold increased risk of cancer of the tongue (95% CI, 2.9–33.1) and a 14-fold increased risk (95% CI, 4.2–49.5) of cancer of the mouth compared with nonsmokers (Table 2). When smokers of low-tar cigarettes were chosen as the reference category, those who smoked cigarette brands with a tar yield of more than 22 mg had OR of approximately two for both cancer sites, after allowance for all major smoking-related variables (not shown).

Alcohol-related variables are shown in Table 3. The patterns that emerged for the two cancer sites were similar. A highly significant direct trend with an increasing number of glasses of wine consumed per week emerged. Significantly elevated risks, however, were apparent only in those who reported 56 or more glasses

per week (i.e., approximately 1 l of wine per day or more). Particularly elevated OR were found in those who reported drinking 84 or more glasses of wine per week (OR, 8.8; 95% CI, 3.4–22.6 for cancer of the tongue and OR, 6.8; 95% CI, 2.4–19.3 for cancer of the mouth). Beer and hard liquors were consumed less frequently than wine and seemed to have little influence on cancer risk for both sites (Table 3). Apparent protection against the risk for cancer of the mouth, afforded by the consumption of hard liquors, disappeared after allowance for wine intake (not shown). Total alcohol consumption, therefore, mostly reflected wine consumption, again resulting in similar OR for cancer of the tongue and the mouth.

The distribution of cases of cancer of the tongue and the mouth and of the control group according to approximate consumption tertiles of various indicator foods and nonalcoholic beverages is given in Table 4. Major sources of proteins and fats in the Italian diet (beef, milk, eggs, oil, and cheese) and some nonalco-

Table 3. Distribution of 102 Patients With Cancer of the Tongue, 104 Patients With Cancer of the Mouth, and 726 Control Subjects According to Drinking Habits (Northern Italy 1986–1990)*

Drinking habit	No. of control subjects	Patients with cancer of the tongue		Patients with cancer of the mouth	
		No.	Odds ratio† (95% confidence interval)	No.	Odds ratio† (95% confidence interval)
Glasses of wine/wk					
0–6	72	6	1‡	9	1‡
7–20	97	5		6	
21–34	215	10	0.7 (0.3–1.8)	15	1.0 (0.5–2.3)
35–55	173	15	1.2 (0.5–2.9)	21	1.7 (0.8–3.6)
56–83	143	47	3.9 (1.8–8.1)	42	3.6 (1.8–7.4)
≥ 84	26	19	8.8 (3.4–22.6)	11	6.8 (2.4–19.3)
Chi-square trend			41.5§		24.5§
Glasses of beer/wk					
0	477	67	1‡	80	1‡
1–13	114	14	1.1 (0.6–2.2)	11	1.0 (0.5–2.0)
≥ 14	135	21	1.1 (0.6–2.0)	13	1.0 (0.5–1.9)
Chi-square trend			0.1		0.1
Glasses of hard liquor/wk					
0	405	57	1‡	71	1‡
1–6	112	11	0.7 (0.3–1.4)	9	0.5 (0.2–1.1)
≥ 7	209	34	1.0 (0.6–1.6)	24	0.5 (0.3–1.0)
Chi-square trend			0.1		5.6
Total drinks/wk					
≤ 19	138	8	1‡	13	1‡
20–34	160	4	0.4 (0.1–1.5)	12	1.1 (0.5–2.6)
35–59	233	44	3.0 (1.3–6.8)	40	2.1 (1.0–4.3)
≥ 60	195	46	3.4 (1.4–8.0)	39	3.0 (1.4–6.6)
Chi-square trend			18.6§		11.5§

* Total sample size varies with the number of patients and control subjects with incomplete information.

† Estimates from logistic regression adjusted for age, area of residence, occupation, and smoking habits.

‡ Reference category.

§ $P < 0.01$.

|| $P < 0.05$.

Table 4. Distribution of 102 Patients With Cancer of the Tongue, 104 Patients With Cancer of the Mouth, and 726 Control Subjects According to Consumption of Various Indicator Foods (Northern Italy 1986–1990)*

Indicator food	Frequency consumption tertile								
	Control subjects			Patients with cancer of the tongue			Patients with cancer of the mouth		
	Low	Intermediate	High	Low	Intermediate	High	Low	Intermediate	High
Green vegetables	168	241	317	28	38	36	43	36	25
Carrots	176	336	214	41	39	22	42	46	16
Fresh fruits	216	227	283	41	32	29	53	28	23
Whole-grain bread and pasta	598	70	58	96	5	1	99	1	4
Beef	258	248	220	36	45	21	35	43	26
Fish	300	304	122	46	37	19	45	46	13
Liver	243	388	95	37	45	20	32	52	20
Milk	261	220	245	42	27	33	49	36	19
Eggs	257	279	190	30	38	34	36	42	26
Margarine	600	111	12	84	13	3	86	18	—
Oil	427	226	62	42	57	3	22	74	8
Butter	323	306	97	21	65	15	40	54	10
Cheese	251	230	245	40	24	38	51	26	27
Coffee	236	243	247	35	33	34	40	39	25
Decaffeinated coffee	685	41	—	101	1	—	101	3	—
Tea	591	135	—	87	15	—	96	8	—
Cola-containing beverages	694	32	—	101	1	—	103	1	—

* Total sample size varies with the number of patients and control subjects with incomplete information.

holic beverages (decaffeinated coffee and cola-containing beverages) did not seem to have a significant influence on the probability of having cancer of the mouth or the tongue (not shown).

Table 5 shows indicator foods and nonalcoholic beverages significantly associated with cancer of the tongue and/or cancer of the mouth. After considering the potential confounding effect of nondietary factors (including smoking and alcohol), a high intake of green vegetables, carrots, fresh fruits, coffee, and tea seemed to be associated with a reduced risk at both sites. In all

instances, the protection afforded by such foods and beverages seemed to be greater, although not significantly different, for cancer of the mouth than for cancer of the tongue. Conversely, consumption of whole-grain bread and pasta exerted a similar significant favorable effect on both cancer sites, and butter intake was associated positively only with the risk of cancer of the tongue.

When a multiple-logistic regression curve was fitted, including simultaneously all nondietary and dietary significant risk factors, the OR for all indicator

Table 5. Odds Ratios for Indicator Foods Significantly Associated With Cancer of the Tongue and/or of the Mouth (Northern Italy 1986–1990)*

Indicator food	Odds ratio† (95% confidence intervals)								
	Tongue cancer				Chi-square (trend)	Mouth cancer			Chi-square (trend)
	Frequency consumption tertile			Low		Frequency consumption tertile		High	
Low	Intermediate	High	Low		Intermediate	High			
Green vegetables	1	1.0 (0.6–1.8)	0.8 (0.4–1.5)	0.6	1	0.7 (0.4–1.1)	0.4 (0.2–0.8)	6.3‡	
Carrots	1	0.6 (0.4–1.0)	0.6 (0.3–1.1)	3.7	1	0.5 (0.3–0.9)	0.4 (0.2–0.7)	10.5§	
Fresh fruits	1	1.0 (0.6–1.8)	0.8 (0.5–1.3)	0.8	1	0.6 (0.3–1.0)	0.5 (0.3–0.8)	7.3§	
Whole-grain bread and pasta	1	0.6 (0.2–1.5)	0.1 (0.01–0.8)	9.5§	1	0.1 (0.01–0.8)	0.5 (0.2–1.4)	6.7§	
Butter	1	2.5 (1.5–4.3)	2.0 (1.0–4.2)	7.1§	1	1.3 (0.8–2.0)	0.9 (0.4–2.0)	0.1	
Coffee	1	0.7 (0.4–1.3)	0.6 (0.3–1.1)	3.2	1	0.7 (0.4–1.2)	0.3 (0.2–0.6)	12.9§	
Tea	1	0.8 (0.5–1.6)	—	0.9	1	0.4 (0.2–0.9)	—	5.5‡	

* Total sample size varies with the number of patients and control subjects with incomplete information.

† Estimates from logistic regression adjusted for age, area of residence, occupation, smoking, and alcohol habits.

‡ $P < 0.05$.

§ $P < 0.01$.

foods and nonalcoholic beverages shown in Table 5 remained substantially unchanged, although as a result of colinearity problems, 95% CI were broader (not shown).

Discussion

Our study confirmed several previous reports on cancer of the oral cavity,³⁻¹⁸ including our own,^{8,18,24} that established a strong adverse effect of tobacco smoking and alcohol drinking and a significant protective effect of fresh fruits and vegetables. The opportunity to differentiate the epidemiology of cancer of the tongue from that of cancer of the mouth provided, however, a few additional hints on possible differences in the causes of cancer at such sites.

First, although cancer of the tongue represented 58% of cancer cases in Pordenone province (a still partly rural area), only 37% of cases were found in the greater Milan area.

Second, in regard to smoking, we confirmed that this behavior was the strongest risk factor both in terms of OR and attributable risk (83% and 86% for cancer of the tongue and mouth, respectively, versus 55% and 46% from alcohol intake). Also similar in cases of cancer of the tongue and cancer of the mouth and consistent with previous reports²⁵ was the difference according to the type of cigarettes smoked. An approximately twofold elevated risk was associated with smoking cigarette brands with tar yields of 22 mg or more per cigarette.

A few noteworthy qualitative differences, however, emerged. Although based on only 12 smokers who did not smoke cigarettes, the risk from smoking pipes and cigars was substantially higher in regard to cancer of the mouth than cancer of the tongue. In cancer of the mouth, it apparently was more elevated than the risk associated with heavy cigarette smoking. In biologic terms, the well-documented strong excess of oral cancer risk in pipe and cigar smokers probably can be explained by the fact that the alkaline smoke from pipes and cigars, because of the irritation it induces, is not taken into the lung as readily and tends to be held by the smoker in the oral cavity.⁵ Particulate matter and possibly other carcinogenic compounds of tobacco may deposit to a greater extent in sites of the oral cavity, such the floor of the mouth compared with the tongue, which is highly mobile.

Following the same line of reasoning, it is possible to interpret another one of our findings, namely the general protection and the particularly strong beneficial effect on cancer of the mouth conferred by food items that tend to be eaten raw (green vegetables, carrots, and fresh fruits) and contain large amounts of fibers

(whole-grain bread and pasta). A few negative associations between the risk of cancer of the mouth and consumption of nonalcoholic beverages, such as coffee, tea, and to a lesser extent, cola-containing beverages and milk (if not a chance finding), also might be explained in terms of a mechanical cleansing effect. Again, this was less important in the development of cancer of the tongue than of cancer of the mouth. Our study, however, like most epidemiologic studies, lacked the precision to determine whether the risk is modified by each food item per se or rather by specific micronutrients (e.g., vitamin C, vitamin E, or beta-carotene). Both beta-carotene and several retinoids can induce the regression of oral leukoplakia.²⁶

Among studies that have examined the association of tobacco and alcohol with cancer of the tongue and other sites of the oral cavity separately, some have not reported any remarkable difference between sites.^{3,12} Others found that trends with smoking and drinking were slightly weaker for cancer of the tongue than for other sites.⁷ In most studies^{7,13,14} and ours, pipe and cigar smoking was associated more closely with mouth cancer than with tongue cancer.

In regard to the influence of nutrition, with few exceptions,^{3,4,17} most case-control studies on oral cancer also found that high intake of fresh fruit conferred an overall significant protection.^{13,15,16,27,28} Conversely, vegetable consumption did not emerge as a protective factor in several investigations.^{3,4,9,15,16} In some studies,^{13,15} the strongest protective effect derived from citrus fruits and, among vegetables, from those that were more likely to be eaten raw, such as fresh tomatoes, green peppers, carrots, and lettuce.¹⁸ Only one study¹⁵ reported OR in quartiles of fruit consumption for different subsites of the oral cavity separately, without, however, detecting any difference. Finally, results were reported of a case-control study on 57 patients with cancer of the tongue and 353 control subjects.¹⁹ In agreement with our study, they found that black tobacco smoking (some high-tar cigarette brands sold in Italy), alcohol drinking, and infrequent vegetable intake were the strongest risk factors for cancer of the tongue in Uruguay.

Strengths and weaknesses of hospital-based case-control studies have long been discussed,²⁹ and also these were examined in detail in our data set.³⁰ The choice of hospital control subjects could lead to bias in the estimation of OR for life-style habits and diet. The exclusion of illnesses that could be related to alcohol and tobacco or that cause changes in dietary habits and the inclusion of patients from the same catchment areas added, however, some confidence to our results. Moreover, in addition to the high participation rate, information bias was unlikely to have occurred because tobacco and alcohol consumption still have a high social accep-

tance in Italy and the role of diet in cancer of the oral cavity has not gained public attention.

In conclusion, our results confirmed the predominant and similar importance of cigarette smoking and the consumption of alcohol and fresh fruits and vegetables in the etiology of cancer of the tongue and mouth. Furthermore, although the differences in the effects of various risk factors were not significant, it suggests that the tongue (because of its greater mobility) may be affected less by pipe and cigar smoking than other sites of the oral cavity. Using the same reasoning, all foods and, perhaps, nonalcoholic beverages that could contribute to the mechanical cleansing of potential carcinogens may provide greater protection against the development of cancer of the mouth than cancer of the tongue.

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