

ENVIRONMENTAL AND BEHAVIOURAL HEAD AND NECK CANCER RISK FACTORS

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SUMMARY

Objectives: The high incidence of head and neck cancer (HNC), significantly associated with living environment and behaviour, can be prevented more efficiently. The aim of this study was to evaluate the environmental and behavioural risk factors for HNC.

Methods: Using a detailed questionnaire on social status, education, living and occupational environment exposures, family cancer and lifestyle, HNC patients (103 cases, 76.7% of men) were compared with control subjects (244 subjects, 73% of men) balanced by age: mean (standard deviation) 63.8 (9.3) and 63.8 (9.0) for cases and controls, respectively.

Results: The results of this study showed that smoking and low education were significant risk factors for HNC regardless of sex. Family HNC and breast cancer were significant predictors of HNC risk.

Conclusion: The study confirmed previous results that smoking and low education are significantly associated with HNC. Additionally, results pointed to significant HNC and breast cancer risk in HNC patient's families that may have originated from passive smoking or a smoking habit stemming from social environments that support it. Better dissemination programmes regarding smoking risks for children and adults are needed, targeting not only individuals but also families.

Key words: head and neck cancer, aetiology, family cancer, smoking, education

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INTRODUCTION

Head and neck cancers (HNCs) are ranked as the sixth most frequent type of cancer worldwide. It is well known that tobacco and alcohol represent major risk factors for the development of HNCs (1), especially due to their synergistic effect. The human papilloma virus (HPV) is another well-known aetiology factor of some HNCs types and is associated with sexual practices (such as oral/genital/anal sex) (2). Similarly to other cancer types, genetic susceptibility and genetic polymorphisms play an important role in HNC aetiology (3, 4). Smoking, drinking > 3 alcoholic beverages per day, particularly for individuals with a slow ethanol metabolism, low income, and low educational level (5–7) have been described as behavioural risk factors. Residence and occupational exposure were also reported as important in HNC risk (8–10). The association between family cancer incidence and HNC risk (11, 12) places HNC patients in a broader frame of their impact on family and vice versa; not only in the context

of genetic predisposition but also living environment conditions that can be modified and prevented.

The aim of this study was to compare living environment, occupational exposure, education, residence, family cancer, diet, smoking, and alcohol consumption parameters in HNC patients with a control group in order to gain better insight into the intricate dynamics of causality between the aforementioned factors and HNC.

MATERIALS AND METHODS

Study Group

This study recruited 103 HNC patients (76.7% of men) and 244 control subjects (73% of men). The recruitment of HNC patients and interviewing was conducted at the School of Dentistry, Clinic for Tumours within the Clinical Hospital Centre “Sisters

of Mercy” and the Department of Oncology within the Clinical Hospital Centre “Zagreb”, Zagreb, Croatia, during a period of one year. Control subjects were recruited at the ambulance for general dentistry within the School of Dentistry, Zagreb, Croatia, visited by the general population without restrictions, such as those based on health insurance status. Data on control subjects were collected within the same period as cancer cases and had a similar regional distribution of residence. Control subjects were selected to be balanced with HNC patients according to age and sex. The Ethics Committee of the School of Dentistry approved the study and each participant signed an informed consent according to the Declaration of Helsinki.

A structured questionnaire with 35 questions provided information on age, lifestyle (tobacco smoking, alcohol consumption), diet (type of meat, fruit, vegetable, and milk intake), occupational exposure, exposure to insecticides and herbicides, marital status, education, residence (industry, highway and railway vicinity, rural, urban), and family history of cancer.

Statistics

The characteristics of patients and controls were analysed using descriptive statistics. The unconditional logistic regression model was fitted to the data. A backward stepwise process was performed to choose the variables inserted in the statistical model. Furthermore, some variables suspected a priori to be predictors of disease (alcohol consumption, smoking habit) or confounders were explored anyway, regardless of the stepwise process. The likelihood ratio test (LRT) was applied to assess the significance of

each variable in the logistic model. Finally, the variables included in the model were age, gender, smoking habit, diet, residence, alcohol consumption, exposure to insecticides and herbicides, education, and family history of cancer. For categorical variables, the odds ratio (OR) provided by the logistic model expresses the risk due to a specific category relative to a reference category. Through statistical modelling, the OR of a variable was adjusted for the joint effect of other variables included in the model (13). STATA software was used for all statistical analyses (StataCorp., 2015, Stata Statistical Software: Release 14. College Station, TX: StataCorp LP).

RESULTS

A total of 103 patients with HNC and 244 control subjects met the requirements to be eligible for statistical analysis. Within the group of patients, 76.7% were men and within the control group 73% were men. Patients and control subjects were perfectly balanced with respect to age: mean (standard deviation) 63.8 (9.3) and 63.8 (9.0) for cases and controls, respectively. Table 1 shows the variables included in the logistic model. As expected, age and gender did not differ between the cases and controls. HNC patients had a rate of ever smokers equal to 1.5 of that of control subjects. As a result, the logistic model showed OR of 3.21 (95% CI 1.76–5.87) related to smoking habit. Patients showed a relative frequency of subjects with low educational level 4 times higher than control subjects. Compared to high school, the lowest levels of education showed a high risk for oral cancer (OR = 4.11; 95% CI

Table 1. Comparison of smoking habit, education, family history of cancer and alcohol consumption between head and neck cancer patients (N=103) and control subject (N=244)

Variable	Cases n (%)	Controls n (%)	OR*	95% CI	p-value LRT
Age: mean (SD)	63.8 (9.3)	63.8 (9.0)	1.01	0.98–1.04	0.601
Gender					
Females	23 (22.3)	56 (23.0)	Ref.	–	0.399
Males	79 (76.7)	178 (73.0)	1.11	0.57–2.15	
Smoking					
Never smokers	20 (19.4)	114 (46.7)	Ref.	–	<0.001
Ex + current smokers	83 (80.6)	129 (52.9)	3.21	1.76–5.87	
Education					
Primary and elementary school	27 (26.2)	16 (6.6)	4.11	1.88–8.97	<0.001
High school	53 (51.5)	121 (49.6)	Ref.	–	
Student or higher	21 (20.4)	98 (40.2)	0.54	0.29–0.99	
Family history of cancer					
No	46 (44.7)	144 (59.0)	Ref.	–	0.005
Yes	56 (54.4)	95 (38.9)	2.17	1.27–3.70	
Alcohol quantity (drinks)					
Less than 1	57 (55.3)	130 (53.3)	Ref.	–	0.475
1–2	34 (33.0)	81 (33.2)	1.04	0.58–1.87	
≥3	10 (9.7)	23 (9.4)	0.72	0.29–1.79	

The variables do not add up to 103 and 244 for cases and controls, respectively, due to missing data. LRT – likelihood ratio test.

*OR adjusted by age, gender, smoking habit, education, family history of cancer, and alcohol quantity.

1.88–8.97) while, on the contrary, higher schooling levels seemed to act as a protective condition (OR=0.54; 95% CI 0.29–0.99).

Alcohol consumption revealed no trend towards increased risk of HNC. Men and women showed no significant difference in this parameter. Similarly, there was no significant difference between HNC patients and control subjects concerning meat and meat type consumption, vegetable consumption, residence close to railway station or highway, and occupational exposure. A very weak synergistic effect, due to smoke alone and only in the 1–2 level of alcohol consumption (OR=3.35; 95% CI 1.45–7.74) was observed; moreover, the LRT interaction test was not statistically significant ($p=0.212$).

Family history of cancer was reported significantly more in HNC patients than in controls (54.4% vs. 38.9%, respectively) and the related OR was 2.17 (95% CI 1.27–3.70). Head and neck cancer (OR=4.39; 95% CI 1.14–17.0) and breast cancer (OR=6.85; 95% CI 2.17–21.7) in parents and first cousins were significant predictors for HNC cancer (Table 1).

DISCUSSION

The results of this study show that smoking and low education were significantly associated with HNC risk. HNC and breast cancer in the cancer patients' families were significant predictors of HNC risk. Behavioural characteristics such as alcohol consumption, diet, occupation, and residence showed no correlation with HNC risk regardless of sex and age of the participants.

Smoking has already been reported to play a significant role in HNC carcinogenesis (5). The incidence of HNC was higher in men than in women (14–16), which reflects the larger number of men with a smoking habit than women, but also the higher impact of testosterone increase in men caused by cotinine (17), having in mind the significance of testosterone/oestrogen balance in carcinogenesis (18).

Alcohol consumption in our study was not significantly associated with HNC, although in women, despite their small number, a borderline significance was present. Some studies reported an association between HNC and alcohol consumption in persons who drank more than 3 drinks per day (6). We might speculate that our patients were not sincere when responding to the question regarding alcohol intake. Underreporting of alcohol drinking may be similar to that concerning smoking in other studies (19).

The mean age of our HNC patients was in accordance with other studies, which showed that patients' age between 60 and 80 years was associated with a higher risk of HNC (20). This may be also explained by longer periods of smoking, which increases the risk of HNC development (21).

Low educational level was a significant factor for HNC risk in our study and demonstrated the need for better preventive measures. Similar results were obtained in other studies and this cannot be explained solely by higher cigarette smoking and alcohol intake (22–26).

Place of residence (rural or urban) and distance from highway or railway was also recorded (8), although no significant differences were found within this study. Occupation was not associated with a higher risk of HNC, which is contrary to studies that highlighted exposure to certain chemicals (solvents etc.) as significant in its aetiology (9, 10).

Significantly increased risk of HNC in subjects with first-degree relatives who had HNC was in agreement with previously published results (11, 12). The novel result of our study was a significant association between breast cancer in first-degree relatives and HNC. Breast cancer risk is associated with smoking and increased levels of testosterone have a significant role in breast cancer aetiology (27, 28). Such results may suggest increased risk of breast cancer due to family passive smoking exposure or smoking habit.

CONCLUSION

In conclusion, HNC associated with smoking and education can be prevented. The families of HNC patients are burdened with increased HNC and breast cancer risk either due to passive smoke exposure or smoking. Increasing awareness of smoking risks should be more focused on the family as a target social group in anti-smoking programmes incorporated into school and local community activities.

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Conflict of Interests

None declared

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