The Relationship between Occupations and Head and Neck Cancers

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Objective: The objective of this study was to investigate the relationship between occupation and head and neck cancers.

Patients and Methods: In this case-control study, 206 Turkish patients with head and neck cancers comprised the case group. The control group consisted of 206 age- and sex-matched patients without malignant disease. All patients completed a questionnaire regarding occupation; tobacco and alcohol consumption; educational status; and history of any systemic disease, benign head and neck disease, and cancer among family members. High-risk jobs were considered those in the industries of construction, wood, mining, metal, chemistry and agriculture.

Results: Patients with head and neck cancers worked in high-risk occupations more frequently than did controls [odds ratio (OR): 3.42, $p<0.05$]. Cancer risk decreased with the increase in time interval between quitting the high-risk job and time of interview. Smokers were at higher risk than nonsmokers (OR: 3.33, $p<0.05$). The risk was also higher in patients who drank alcohol regularly (OR: 1.59, $p<0.05$). However, occupation was found to be an independent high-risk factor for head and neck cancers in regression analysis. Frequency of benign head and neck disease and family history of cancer were not significant risk factors ($p>0.05$).

Conclusion: Our analysis showed that occupation and smoking were significant independent risk factors for the development of head and neck cancers among workers.

Key words: head ■ neck ■ tumors ■ risk factors ■ smoking ■ alcohol

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INTRODUCTION

Cancer morbidity and mortality rates increase with an increase in industrialization. The average age-related cancer mortality rate in developed countries is more than twice that of developing counties.[1,2] The overall cancer incidence is 1.8-fold higher in men and 1.3-fold higher in women in developed countries than in developing countries.[3] In industrialized societies, 4% of all cancers are associated with occupation. Moreover, the incidence of cancer is identified as 20% for high-risk occupational groups.[3] The International Agency for Research on Cancer (IARC) identified 20 different chemical and physical carcinogens that are used in various industries.[4]

Head and neck cancers are a heterogeneous group of cancers that include cancers of the skin of the head and neck, nasal cavity, paranasal sinuses, nasopharynx, lip, oral cavity, oropharynx, larynx, hypopharynx, cervical esophagus, cervical trachea, neck, salivary glands and the parapharyngeal region.[5] Head and neck cancers constitute 9% of all cancers overall and are responsible for 4% of all cancer-related deaths. These cancers occur more frequently in men (male:female ratio of 4–5:1).[6,7] Although there is no detailed statistical information about the incidence and mortality rates for all head and neck cancers in Turkey, available data reported in 1997 showed that the mortality rates of oral cavity and pharyngeal cancers were about 0.14% and 4.4% in men and 0.2% and 3.7% in women, respectively.[8] The incidence of laryngeal cancers was reported in 1992 as 4% for men and 1.7% for women in Turkey.[9]

The major risk factors for head and neck cancers are tobacco and alcohol consumption.[10,11] Hereditary, nutritional, environmental and hygienic factors are also reported to be important risk factors.[12-14] Recently, the role of oncogenes in the etiology and pathogenesis of head and neck tumors have also been extensively explored.[13] More data regarding the occupation as an important risk factor for the development of head and neck cancer has become available in the last 30 years.[3] A study by Acheson et al. was the first study to report an increase in nasal cancer incidence among wood work-

ers.[15-18] In the Turkish population, there are no data regarding occupational cancer incidence. Our study was designed to determine the relationship between occupation and the development of head and neck cancers among certain groups of workers.

MATERIALS AND METHODS

Between April 1996 and October 1997, we performed a case-control study among 206 workers with histologically proven head and neck cancer at Ankara Diskapi Social Security Hospital, the largest hospital in Turkey mainly serving for workers in Ankara, Turkey. All head and neck cancer cases without any exclusion were eligible for the study. For the control group, 206 age- and sex-matched patients without any malignancy in the orthopedics ward of the same hospital were taken. For age match, we accepted 3 years of interval for the corresponding patient.

We define high-risk jobs as those primarily involved in the industries of construction, agriculture, wood, mining, metal and chemistry, according to the literature data.[13] Other jobs were considered to be low-risk occupations.

All patients were interviewed by the same physician and were asked to complete a questionnaire. The questionnaire related to occupation; duration of working in the occupation; interval since leaving the occupation, if applicable; duration and frequency of tobacco and alcohol consumption; educational status; and history of any systemic disease, benign head and neck disease, or cancer among other family members.

The Chi-squared test was used to compare the qualitative variables between the control and case groups. We used the multivariate logistic regression analysis to identify the independent risk factors, including occupation, smoking and alcohol consumption. The multiple logistic regression model was used to calculate adjusted odds ratios (ORs) of the factors. Head and neck cancer was criterion variable. ORs of occupation adjusted for smoking and alcohol consumption. All statistical analyses were performed by using SPSS® version 9 statistics software.

RESULTS

The median age was 52 years (range 18–77 years) for the control group and 53 years (range 19–80 years)

Table 1. Characteristics of the patients

	Case (n)	Case (%)	Control (n)	Control (%)
Age (Years)				
18–30	10	4.9	13	6.3
31–40	18	8.7	20	9.7
41–50	55	26.7	53	25.7
51–60	68	33.0	66	32.0
≥61	55	26.7	54	26.2
Sex				
Male	183	88.8	23	11.2
Female	183	88.8	23	11.2
Education				
Illiterate–literate	56	27.2	35	17.0
Primary school	135	65.5	142	85.9
High school + university	15	7.3	29	14.1
Marital Status				
Married	203	98.5	199	96.6
Single	3	1.5	7	3.4
Alcohol				
Nonuse	144	69.9	162	78.6
Use	62	30.1	44	21.4
Smoking				
Yes	173	84.0	126	61.2
No	33	16.0	80	38.8
Occupation				
High Risk				
Agriculture	54	26.2	20	9.7
Construction (n=31)	31	15.0	31	15.0
Wood Industry (n=12)	12	5.8	4	1.9
Mining + metal (n=23)	28	13.6	20	9.7
Chemical (n=12)	12	5.8	1	0.5
Textile (n=6)	6	2.9	4	1.9
Transportation (n=12)	12	5.8	17	8.3
Low Risk	51	24.8	109	52.9
Total	206	100.0	206	100.0

for the case group (p=0.966). Most persons studied were >40 years of age (86% in the case group and 84% in the control group). Because we also selected sex as a matching variable, both groups had the same numbers of men (n=183) and women (n=23). Marital status and frequency of benign head and neck disease were similar in the case and control groups (Table 1).

Larynx was the most frequently involved site (58.2%) in the case group. Other cancers were salivary gland tumor (16.5%), oral cavity cancer (15.5%), paranasal sinus tumor (4.9%) and nasopharynx cancer (4.9%). The female:male patient ratio was 1:59 for laryngeal cancer, 1:4 for oral cavity cancer, 1:3 for nasopharynx cancer, 1:2 for paranasal sinus tumor, and 1:2 for salivary gland tumor (Table 2).

When we compare groups according to high-risk and low-risk jobs, case group occupations were 75% in high-risk jobs and 25% in low-risk occupations, whereas in the control group 47% were in high-risk jobs and 53% were in low-risk occupations. There was a significant difference (p=0.000) between case and control groups in regard to occupation in a high-risk job and other low-risk job groups (OR: 3.145, 95% CI: 2.2–5.1) (Table 3).

Duration of occupation was also analyzed both in case and control patients, and 70.4% of patients in the cancer group and 66% of controls had been employed >21 years; however, only 4.4% of cases and 7.8% of controls had performed the same work for 1–10 years. In the case group, farmers who worked >21 years had more head and neck cancers. A comparison of case and control groups regarding the duration of employment did not show any relation (p=0.319). The duration of high-risk occupation and head and neck cancer cases are summarized in Table 4.

Most subjects in both the case (53%) and control (62%) groups were still actively working in the same field (Table 5). There was a statistically significant difference between the case and control groups with regard to the duration between leaving the job and the time of interview (p=0.036). With an increased interval between leaving the job and the date of analysis, there was a decrease in cancer incidence.

We also analyzed smoking, a major risk factor for the development of head and neck cancers. The analysis showed significantly more nonsmokers in the controls (38.8%) when compared to cancer patients (16%) (p=0.000) (OR 3.3, 95% CI: 2.0–5.3). The amount of cigarette smoking was associated with the risk of cancer. Twenty-one cigarettes and more per day was associated with an 8.7-fold increase in head and neck cancers, whereas 11–20 cigarette per day was associated with a 2.1-fold increase in risk. Duration of smoking was also closely related to the incidence of head and neck cancers (p=0.000). Patients who smoked ≥21 years had a risk of developing head and neck cancers 12.8 times greater than nonsmokers (95% CI 6.69–24.63). The longer the duration of smoking, the greater the risk of developing head and neck cancers. Those who had smoked for 11–20 years had a significantly higher incidence of cancer than those who had smoked for 1–10 years.

The distribution of case and controls according to time to quitting smoking showed a statistically significant difference between the two groups (p=0.000). Sixty-seven percent of persons in the case group and 47% of persons in the control group were still smoking at the date of interview.

Alcohol consumption was also significantly different between the two groups (p=0.042). Patients who regularly drank alcohol daily had 4.6 times more risk of cancer than nondrinkers (OR: 1.59, 95% CI: 1.8–11.3). Occasional drinking (4–5 times per month) did not increase the risk of head and neck malignancy. Duration of alcohol consumption was also analyzed, and the results showed no rise in risk for 1–10 years or 10–20 years of alcohol consumption for the development of head and neck cancers. However, we found a 2.8-fold increase in head and

Table 2. Distribution of cases among the malignancies

Diagnosis	Case (n)	Case (%)
Larynx	120	58.2
Oral cavity	32	15.5
Nasopharingeal	10	4.9
Nasal cavity + paranasal sinus	10	4.9
Salivary gland	34	16.5
Total	206	100

Table 3. Distribution of case and controls among occupations

Occupations	Case (n)	Case (%)	Control (n)	Control (%)
High risk	155	75.2	97	47.1
Low risk	51	24.8	109	52.9
Total	206	100	206	100

χ^2=34.374, p=0.000; OR=3.415 (95% CI: 2.2–5.1)

Table 4. Distribution of cases and controls according to duration of work

Occupations/Year	Case (n)	Case (%)	Control (n)	Control (%)
1–10 years	9	4.4	16	7.8
11–20 years	52	25.2	54	26.2
≥21 years	145	70.4	136	66.0
Total	206	100	206	100

χ^2=2.286, p=0.319

neck cancers in subjects with ≥21 years of alcohol intake (p=0.009, 95% CI: 1.2–6.1) (Table 6). The distribution of subjects in both groups according to time interval between stopping alcohol intake and date of interview showed a significant difference between groups (p=0.020).

Logistic regression analysis model for occupation, smoking and alcohol use showed that occupation (p=0.000, OR: 3.066; 95% CI: 1.9–4.7) and smoking (p=0.000, OR: 2.565; 95% CI: 1.5–4.2) were independent risk factors for the development of head and neck cancers (Table 7).

DISCUSSION

Our study showed that certain occupations such as chemical industry, wood industry, farming, construction and mining are independent risk factors for the development of head and neck cancers. Besides occupation, smoking is also shown to be an independent risk factor.

In the current study, we grouped jobs as high-risk and low-risk occupations for the development of head and neck cancers according to the literature.[1,3,15,19-21] Our head and neck cancer patient group occupations were 75% in high-risk jobs and 25% in low-risk occupations, whereas in the control group 47% were in high-risk jobs and 53% in low-risk occupations. There was a significant difference (p=0.000) between case and control groups in regard to occupation in a high-risk job and other job groups.

Nasopharyngeal carcinoma was most frequently diagnosed in farmers (30%) in our study, in accordance with previous reports.[22] Oral cavity cancers were not considered as occupational cancers previously.[23] However, wood dust and some organic compounds have been argued in the literature to cause oral cavity cancers.[19] In our study, oral cavity cancers were most frequently seen in farmers (37.5%) followed by workers in low-risk occupations (21.9%) and then construction workers (18.8%). Laryngeal cancers were most frequently observed in persons in low-risk occupation (23.3%), followed by farmers (22.5%). Our finding about laryngeal cancer is consistent with literature data that report agricultural work as a risk factor for head and neck cancer.[20] Fifty percent of nasal cavity and paranasal sinus cancers were observed in persons in low-risk occupations. However, previous studies showed an increased risk for persons in the wood and furniture industry, in which workers are exposed to wood dust.[15,16,21]

The etiology of salivary gland tumors is not clearly defined. However, radiation exposure and occupation in the wood industry have been reported as possible etiological factors.[24] In our study, 32.4% of salivary gland tumor cases were in farmers and 29.4% were in low-risk occupations.

We grouped our cases into three categories (1–10 years, 11–21 years and >21 years) according to time period of occupation in a specified job. Our study also showed that as the time of occupation in a specified job increased, the risk of cancer also increased.

In this study, we found that the majority of patients were still actively working in the same field. As the time between leaving the high-risk job and the time of analysis increased, the incidence of head and neck neoplasm decreased. Head and neck tumors were least frequently observed in subjects who had left the job ≥21 years ago. These findings further confirmed the effect of occupation on the development of head and neck cancers.

Tobacco and alcohol consumption were clearly shown

Table 5. Distribution of cases and control according to quitting the job

Duration	Case n (%)	Control n (%)
Currently working	109 (52.9)	128 (62.1)
1–10 years	55 (26.7)	38 (18.4)
11–20 years	39 (18.9)	31 (15.0)
≥21 years	3 (1.5)	9 (4.4)
Total	206 (100)	206 (100)

Table 7. Results of the multivariate logistic regression analysis

	ß	P	OR	95% CI
Occupation	1.120	0.000	3.066	1.9–4.7
Alcohol	0.310	0.213	1.363	0.8–2.2
Smoking	0.942	0.000	2.565	1.5–4.2
Constant	-1.469	0.000	0.230	
Total	206	100	206	100

Table 6. Duration of smoking and alcohol use in case and control groups

		Control Group		Case Group			
	Duration (Years)	n	%	n	%	OR	95% CI
Smoking	None (n=113)	80	38.8	33	16.0	–	–
	1–10 (n=37)	24	11.7	13	6.3	1.313	(0.5–2.8)
	11–20 (n=121)	80	38.8	41	19.9	1.242	(0.7–2,1)
	≥21 (n=142)	22	10.7	119	57.8	13.113	(7.1–24.1)
Alcohol	None (n=307)	163	79.1	144	69.9	–	–
	1–10 (n=24)	11	5.3	13	6.3	1.338	(0.5–3.0)
	11–20 (n=44)	20	9.7	24	11.7	1.358	(0.7–2.5)
	≥21 (n=37)	12	5.8	25	12.1	2.358	(1.1–4.8)

to increase head and neck tumors in previous studies.[11,25] Likewise, in our study, alcohol and tobacco use also significantly increased the risk for the development of head and neck malignancies. Smokers were found to bear an increased risk (p=0.000, OR: 3.33; 95% CI: 2.0–5.3); the duration and amount of smoking increased this risk further. Alcohol consumption similarly increased the risk of head and neck malignancies (p=0.042).

We demonstrated that occupation was an independent risk factor for the development of head and neck cancers. People working at jobs defined as high risk had a higher risk of malignancy (p=0.000, OR: 3.145; 95% CI: 2.2–5.1).The most important feature of occupational diseases is that they are preventable. The most effective way to treat occupational cancer is to prevent it, and the most effective way of prevention is to remove carcinogenic agents from the work environment. Simple procedures, such as wearing a mask, may greatly reduce the morbidity and mortality due to occupational head and neck cancers. It might be easier to control occupational hazards than alcohol and tobacco consumption.

People in high-risk occupations should be educated and warned about the hazards of the additional risk caused by smoking and alcohol use. Additionally, exposure to hazardous materials should be minimized from the work environment, and the workers in high-risk occupations should be periodically screened for the development of occupational diseases, especially malignancies.

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