Occupational risk factors for upper respiratory tract and upper digestive tract cancers

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Abstract

A case-control study was conducted to investigate occupational risk factors for upper respiratory and digestive tract cancers (nose, lips, buccal cavity, pharynx, and larynx) in the north of France. Two hundred and eighty three cases of histologically confirmed cancer in men treated during the first semester of 1983 at the Regional Cancer Institute were included in the study. Two controls per case were chosen from patients in the medical wards of the local general hospitals in the same geographical area as the case, who did not have cancer. Controls were individually matched for sex, age (± 18 months), ethnic group, area of residence, and smoking and alcohol drinking history. All subjects were questioned about occupations in which they had worked for at least 15 years. Odds ratios for major occupational categories were estimated using conditional logistic regression for matched samples. Significant associations were found between wood work and nasal cancer (four cases, no control) and farming and lip cancer (odds ratio 5.3, 95% confidence interval 1.1-26.8). Pharyngeal cancer was associated with the textile industry (OR 2.4, 95% CI 1.0-5.7) and the building industry (OR 2.0, 95% CI 1.1-3.9). Coal miners showed a threefold excess risk for cancer of the lip (4 cases, no control), buccal cavity (OR 3.5, 95% CI 1.1-11.8), and larynx (OR 3.2, 95% CI 1.1-9.7).

Mortality from upper respiratory and digestive tract (URDT; nose and sinus, lips, buccal cavity, pharynx, and larynx) cancers in men is higher in France than in all other western countries (27.4 per 100 000 in 1977 compared with 12.5 in Italy which ranks second, and

3.5 in Sweden), and has increased during the past 20 years.¹ Comparisons of incidence rates from the available registries show the same trends.² Within France, mortality from URDT cancers in men is higher in the north and in Brittany.³ The same observations for oesophageal cancer prompted a study which showed the major part played by alcohol and tobacco consumption in the aetiology of this cancer.⁴ No doubt the high incidence of URDT cancers in the north of France might also be partly explained by regional alcohol drinking and smoking habits. Considering the high level of industrial activity in this area, however, a case-control study was undertaken to investigate the possible role of occupational factors in URDT cancers, taking into account alcohol and tobacco consumption.

Methods

Two hundred and eighty three men treated during the first semester of 1983 for histologically confirmed primary URDT cancer at the Regional Cancer Institute were included in our study. This institute is the only centre of its type in the north of France (Nord-Pas de Calais region), and treats over two thirds of URDT cancer patients diagnosed in the region. Examination of the statistics of admission showed no bias for selection on socioprofessional characteristics compared with the region as a whole. Two hundred and thirty four patients (82.6%) had been diagnosed less than one year before inclusion in the study.

For each case two men were chosen as controls from patients in the wards of internal medicine of local general hospitals in the same geographical area as the case, who did not have cancer. Controls were individually matched for age (± 18 months), country of origin (France, southern Europe, eastern Europe, north Africa), area of residence, and smoking and alcohol drinking history. Tobacco consumption was expressed as cigarette equivalents (one pipe = two cigars = four cigarettes). Matching was done separately on class of average daily tobacco consumption (non-smoker or ex-smoker for more than five years, one to nine cigarettes a day, 10-19 cigarettes a day, ≥ 20 cigarettes a day) and number of years smoked ($\pm$ five years). Alcohol drinkers were

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matched according to four groups of average daily consumption (occasional drinkers, < 44 g a day, 44–88 g a day, > 88 g a day; equivalents of pure alcohol, 1 l wine = 88 g, 1 l beer = 44 g, 1 measure spirits = 15 g). Potential controls were first interviewed about their smoking and alcohol drinking habits; if matching was not achieved the interview was not completed.

The causes for entering hospital among the 566 controls were cardiovascular diseases (25%), metabolic diseases (17%), infectious diseases (16%), digestive problems (15%), neurological disorders (8%), skeletomuscular diseases (8%), and miscellaneous diseases (11%).

Cases and controls were interviewed while in hospital by the same person (CM) about their smoking and alcohol drinking history and about the occupations in which they had worked for at least 15 years. Subjects who had not worked in the same type of job for at least 15 years were not included in the study. This led to the exclusion of half the subjects.

Types of occupation were classified into 11 groups—namely, coal mining, the building industry, metal work and mechanics, agriculture, road transport, shipping, the textile industry, wood work, road works, service industries, and others. Only two people had held two different jobs for more than 15 years each and they were assigned to both groups in which they had worked. Odds ratios for having worked in each occupational group were calculated using the Mantel-Haenszel estimation and conditional logistic regression for matched samples.⁵

Results

Table 1 describes the different sites and histological types of URDT cancers included in the study. Cancers of the pharynx, buccal cavity, and larynx

Table 1 Distribution of cases by site and histological type for URDT cancers

		Cases (%) (n = 283)
Site of cancer		
Nose, sinus		14 (4.9)
Lips		16 (5.7)
Buccal cavity		64 (22.6)
Pharynx:		114 (40.3)
Oropharynx	78	
Hypopharynx	36	
Larynx:		54 (19.1)
Supralarynx	12	
Endolarynx	37	
Other		9 (3.2)
Multiple sites		12 (4.2)
Total		283 (100.0)
Histological type for non-multiple sites		
Squamous cell		252 (93.0)
Glandular		7 (2.6)
Non-epithelial cancer		12 (4.4)
Total		271 (100.0)

Table 2 Distribution of cases and controls according to tobacco and alcohol consumption

	Cases (%) (n = 283)	Controls (%) (n = 566)
Tobacco consumption (pack-years)		
0	9 (3.2)	17 (3.0)
1–19	52 (18.4)	95 (16.8)
20–39	134 (47.5)	268 (47.5)
40–59	45 (16.0)	110 (19.5)
≥ 60	43 (15.2)	76 (13.4)
Alcohol consumption (g/day)		
Occasional drinker	42 (14.8)	85 (15.0)
< 44	48 (17.0)	95 (16.8)
44–88	96 (33.9)	192 (33.9)
> 88	97 (34.3)	194 (34.3)

accounted for more than 80% of the cases. Ninety three per cent of the cancers were squamous cell carcinomas.

Close matching was achieved between patients with cancer and controls for country of origin (92% of patients were French), area of residence, age at interview (mean age 58.3 years), and tobacco and alcohol consumption (table 2). Tobacco consumption was slightly lower, and alcohol consumption was much higher than in other case-control studies on oral cavity, pharyngeal, or laryngeal cancers published in the United States and Canada.

Table 3 shows the odds ratio estimates for 11 occupational groups for all sites of cancer combined. These ratios compare the risk of disease for people who worked in these occupations for more than 15 years with the risk of disease for people who never worked in these occupations or those who worked for less than 15 years. Relative risks were significantly greater than one among coal miners, workers in the building industry, and wood workers. Relative risk of URDT cancers for service industries was significantly lower than one.

Analyses related to specific sites of cancer are presented in table 4. Among 14 cases of nose and sinus cancer, four were wood workers. Three had

Table 3 Estimates of odds ratios for different occupational groups for all sites of cancer combined

Occupational group	Cases (n = 283)	Controls (n = 566)	Odds ratio	95% Confidence interval
Mining	48	52	2.6*	1.6–4.3
Building industry	53	59	2.0*	1.3–3.0
Metal work, mechanics	44	83	1.1	0.7–1.6
Agriculture	18	42	0.9	0.5–1.5
Road transport	17	37	0.9	0.5–1.7
Shipping and seamen	14	32	0.8	0.4–1.7
Textile industry	17	27	1.3	0.7–2.5
Wood work	10	7	3.5*	1.2–10.3
Road works	13	27	1.0	0.5–1.9
Service industries	45	179	0.4*	0.3–0.6
Others	7	21	0.7	0.3–1.6

*Odds ratio significantly different from one ($p < 0.05$).

Table 4 Estimation of odds ratios by occupational group for each site of cancer (No of exposed cases/No of exposed controls in parentheses)

	Nose sinus (n = 14)	Lips (n = 16)	Buccal cavity (n = 64)	Pharynx (n = 114)	Larynx (n = 54)	Multiple sites (n = 12)	All sites (n = 283)
Mining	6.0 (3/1)	—* (4/0)	3.5* (11/11)	1.4 (17/28)	3.2* (11/10)	— (2/1)	2.6* (48/52)
Building industry	0 (0/4)	2.4 (3/3)	1.9 (12/14)	2.0* (21/23)	1.5 (8/11)	—* (8/2)	2.0* (53/59)
Metal work, mechanics	— (3/0)	0 (0/5)	1.2 (13/22)	0.7 (16/42)	1.8 (7/8)	1.6 (3/4)	1.1 (44/83)
Agriculture	1.3 (2/3)	5.3* (6/3)	0.3 (1/7)	0.5 (4/15)	1.0 (5/10)	0 (0/3)	0.9 (18/42)
Road transport	1.0 (1/2)	0 (0/2)	0.8 (4/10)	0.8 (6/15)	2.2 (6/6)	0 (0/1)	0.9 (17/37)
Shipping and seamen	0 (0/2)	0 (0/1)	0.5 (3/9)	1.0 (5/10)	1.8 (6/8)	0 (0/1)	0.8 (14/31)
Textile industry	0 (0/1)	0 (0/2)	0.7 (2/5)	2.4* (12/11)	0.3 (1/6)	0 (0/1)	1.3 (17/27)
Wood work	—* (4/0)	0 (0/2)	1.3 (2/3)	— (4/1)	0 (0/1)	— (0/0)	3.5* (10/7)
Road works	0 (0/2)	2.7 (2/2)	2.2 (5/5)	1.8 (5/6)	0.2 (1/10)	0 (0/2)	1.0 (13/27)
Service industries	0.2 (1/11)	0.1* (1/11)	0.5 (11/39)	0.5* (20/67)	0.4* (8/34)	0 (0/8)	0.4* (45/179)
Others	0 (0/2)	0 (0/1)	0.7 (1/3)	1.0 (5/10)	0.5 (1/4)	0 (0/1)	0.7 (7/21)

*Odds ratio significantly different from one ($p < 0.05$);—indeterminate (matched odds ratio could not be computed).

cancer of the ethmoids and one had cancer of the maxillary sinus. Relative risk for cancer of the lip was significantly greater than one among coal miners and among farmers. The only significant excess risk of cancer of the buccal cavity was among coal miners who were also at higher relative risk for laryngeal cancer. A significant relative risk of pharyngeal cancer was shown among workers in the building industry and in the textile industry.

Discussion

It is appreciated that restricting choice of subjects to those who had held one job for at least 15 years introduced a selection; it was the same, however, for both cases and controls. Such a selection precluded the study of short term exposures of employees, and of more recent industrial activities. In computing the odds ratio for a particular occupational group the reference category could include men who had worked in the same group for less than 15 years, or in other occupational groups potentially at risk, and this could bias the results. This seldom happened, however, as employment in the region is stable, and the number of years spent in the reported occupations covered most of the working life of both cases and their matched controls. Furthermore, the choice of this reference category tends to underestimate the relative risks.

NOSE AND LIPS

The associations found in the nose and lips are already established. For instance, the association between exposure to wood dust and nasal cancer has been reported⁶ and lip cancer has been shown to be more frequent among people working outdoors, especially farmers.⁷

PHARYNX

In the present study an excess risk of pharyngeal cancer was seen among workers in the textile industry and occurred in a spread of subgroups—

namely, spinners and winders (4 cases, 5 controls), weavers (2 cases, 3 controls), pressers (1 case, no control), maintenance workers (2 cases, 1 control), and unknown occupations (3 cases, 2 controls). Excess risk was also found in workers in the building industry.

An excess of oral and pharyngeal cancer among textile workers in England has been reported previously,⁸ but this was not confirmed by a later study.⁹ Leather work was associated with cancer of the buccal cavity, pharynx, and larynx,¹⁰ and Elwood and colleagues reported a moderately increased relative risk for these cancers in men with a history of working in the logging and mining industries.¹¹ More recently, a study carried out in France on workers producing manmade mineral fibres showed them to have an excess risk for cancer of the pharynx, the buccal cavity, and the larynx.¹²

Work in the building industry involves various types of exposure, especially to cement dust and insulation material, which might influence the occurrence of pharyngeal cancer in workers from this industry. In our study 15 cases and 11 controls working in the building industry had jobs involving heavy dust exposure (masons, tile layers, plasterers), compared with less dusty jobs (painters, electricians, plumbers) in which six cases and 12 controls had worked.

LARYNX

Occupational risk factors for laryngeal cancer have been extensively studied. Asbestos, nickel refining, wood dust, mustard gas manufacturing, isopropyl alcohol, leather work, and sulphuric acid have all been associated with an excess risk of laryngeal cancer.¹³ More recently, an increased relative risk was found among farmers and textile processors.¹⁴ Olsen and colleagues in Denmark reported high relative risks among workers exposed to dust, drivers, people working in the cement industries and port services,¹⁵ and among workers exposed to welding fumes.¹⁶ A study in Connecticut found a significantly raised

relative risk for machinists,¹⁷ and a non-specific association was found between laryngeal cancer and work as a non-construction labourer.¹⁸ Finally, a mortality study of workers employed in a refractory brick plant showed an increased standardised mortality ratio for laryngeal cancer among workers exposed to silica dust suggesting a role for exposure to silica in the aetiology of this cancer.¹⁹ In the present study excess of laryngeal cancer occurred among coal miners. This could be attributed to exposures to silica dust and oil mists. This point is discussed further below.

COAL MINERS

In our study coal miners were the only group in which three sites of URDT cancers appeared in excess. These were cancers of the lip, buccal cavity, and larynx. Working in coal mines involves specific exposures related to different habits of life style and presence of dusts, fumes, or vapours inside the galleries. Coal miners have reported making frequent use of chewing tobacco, a major risk factor for cancer of the buccal cavity.²⁰ We were unable, however, to quantify this association.

In the coal mines of the Nord-Pas de Calais region no exhaust fumes were present as no combustion engines were used. Industrial hygienists have recently been concerned with the presence of mineral oils used in hydraulic operations and mineral oils have been linked to laryngeal cancer. In addition to the raised relative risk among machinists already mentioned¹⁷ a study of subsequent primary tumours among 288 men with scrotal cancers, most likely induced by cutting oils, found a significant excess of tumours of the larynx, lip, bronchus, stomach, and skin.²¹

Several mortality studies have been conducted among coal miners. An excess of stomach cancer has been found, but no associations with the sites studied here.²² This might be due to competing risks which were stronger in earlier decades. It is also possible that we were able to show such associations because of the high proportion of coal miners (up to 20% of the workforce in the 1950s in Nord-Pas de Calais) in a community where patients with URDT cancers were easily accessible because of the high background rate, due probably to alcohol drinking habits in the region.

We thank Laurence Mandereau for technical help and Evelyne Przybilski for typing the manuscript.

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Accepted 13 November 1989