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Squamous cell cancer of the maxillary sinus in Hokkaido, Japan: a case-control study

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ABSTRACT A case-control study of squamous cell cancer of the maxillary sinus was performed in Hokkaido with 106 cases and 212 controls matched for sex, age (within five years), and residence (same health centre region). Univariate analyses showed that a history of chronic sinusitis (relative risk, RR = 3·2), nasal polyps (RR = 5·0), an occupational history of being a carpenter, joiner, furniture worker, or other woodworker (RR = 2·9), and current or past smoking habits (RR = 3·0) were statistically significant risk factors for men. No single item was a significant risk factor for women.

Cancer of the nasal sinus (International Classification of Diseases, ICD 160) is relatively uncommon but a history of chronic sinusitis, smoking, and an occupational history of work such as nickel refining, chrome manufacturing, mustard gas manufacturing, and furniture and other woodworking are suspected of being risk factors for the development of this tumour.

The cancer registries in some parts of Japan show a relatively high incidence of cancer of the nasal sinus compared with international figures,[1] but there have been few epidemiological studies in Japan.[2-9] The present paper reports the results obtained from a case-control study of squamous cell cancer of the maxillary sinus (ICD 160·2) in Hokkaido which has a relatively high mortality from this tumour.[2]

Methods

Cases of all types of cancer of the nasal sinus were periodically collected from 1982 to 1984 through the courtesy of the two university and the two medical college hospitals in Hokkaido Island. A patient with cancer of the nasal sinus in Hokkaido visits one of the three departments of otorhinolaryngology and the three departments of dental and oral surgery in these hospitals at least once. During the three years of the study 170 cases were diagnosed at these hospitals. Of them, 144 cases (men 83·7%, women 87·2%) had cancer of the maxillary sinus. Histological diagnoses were available for all but one case, a woman aged 82; most were classified as squamous cell carcinoma (men 91·3%, women 82·9%). By limiting the study cases to squamous cell cancers of the maxillary sinus and the study age to from 40 to 79, 110 patients were eligible for inclusion.

Using the telephone directory, we selected ten potential community controls for each case at random. We posted questionnaires to the cases and the potential controls requesting information regarding their families, education, residence, and history of nasal diseases, occupation, smoking habits, passive smoking, and domestic heating systems. If necessary, telephone calls were made to obtain additional information. We repeated the random sampling of potential controls and the posting of questionnaires until we had obtained two community controls for each case matched by sex, age (within five years), and residence (same health centre region).

The data were analysed by the classic methods of analysis of matched data with 1:2 matching and the relative risk was calculated by the Mantel-Haenszel estimator.[10] Correlation analyses of items were undertaken by the usual chi-squared methods.

Results

Of the 110 eligible cases, two refused to cooperate and two were lost to follow up. We wrote to 1472 potential controls and found that 182 were not eligible. Of the remaining 1290 subjects, 1205 replied. Thus the response rates for the cases and the controls were 96·4% (=106/110) and 93·4% (=1205/1290) respectively. The mean ages were male cases 59·9,

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Table 1 *Proportion (%) of subjects with a history of nasal disease, educational history, and smoking habits*

	Cases		*Controls*	
	Men (n = 81)	*Women (n = 25)*	*Men (n = 162)*	*Women (n = 50)*
History of:				
Chronic sinusitis	20·0*	16·0	7·4	8·0
Nasal polyps	10·1†	8·0	2·5	0·0
Nasal trauma	7·5*	4·0	2·5	2·0
History of compulsory education only	72·9	80·0	56·8	76·0
Current or past smoker	91·4	20·0	80·2	14·0

*Only 80 men.
†Only 79 men.

Table 2 *Proportion (%) of subjects with a history of occupations*

	Cases		*Controls*	
Occupational history	*Men (n = 81)*	*Women (n = 25)*	*Men (n = 162)*	*Women (n = 50)*
Motorcycle or auto repair mechanics	1·2	0·0	2·5	2·0
Dealers in dye and chemical substances for industrial use	4·9	0·0	1·9	0·0
Miners of asbestos, coal, or other ores	7·4	0·0	10·5	0·0
Smiths, welders, turners, or solderers	8·6	0·0	4·9	2·0
Plasterers or construction workers	17·3	4·0	14·8	2·0
Carpenters, joiners, furniture workers, or other woodworkers	4·0	28·4	8·0	12·3
Dealers in asphalt, oil, or other petroleum substances	4·9	0·0	6·8	0·0
Workers in boot and shoe industry, textile industry, and tailors	4·0	3·7	4·0	1·9
Transport workers	8·6	0·0	5·6	2·0
Millers	1·2	0·0	2·5	2·0
Farmers	19·8	16·0	16·7	14·0
Fishermen	4·9	0·0	1·9	0·0
Other occupational workers	44·4	44·0	63·0	54·0
Housewives or having no occupation	0·0	100·0	0·0	100·0

Percentages do not total 100% because of multiple occupational histories.

male controls 58·9, female cases 62·6, and female controls 62·3 years. A reply of "unknown" was occasionally made by the respondents, the "unknown" response rate varying item by item. It was relatively high for family history of nasal disease and for passive smoking status, but for history of nasal disease, educational history, occupational history, smoking habits, or domestic heating systems it ranged from zero to 2·9%.

The proportion of subjects with a history of nasal disease is shown in table 1 with educational history and smoking habits. An occupational history was regarded as positive if the subject had been employed in a job for more than one year. Each occupational title refers to a manual job except "other occupational workers," "housewife," and those having no occupation. Although subjects might have several occupations during their lifetime, the proportion of men having only one occupation was 58·4% and of women (other than being a housewife) was 64·0%. We analysed the relation between each occupation and development of maxillary sinus cancer using the remaining occupations in turn as the base line. Table 2 shows the proportion of subjects in each occupational group regardless of a history of other occupations.

Table 3 shows the estimated relative risks of developing squamous cell cancer of the maxillary sinus; the relative risks of some occupations do not appear since they were not statistically significant. Family history of nasal disease and passive smoking status were omitted from the analyses because the "unknown"

Table 3 *Relative risk of developing squamous cell cancer of the maxillary sinus*

Item	*Men*	*Women*
History of:		
Chronic sinusitis	3·2*	3·0
Nasal polyps	5·0*	4/0
Nasal trauma	3·7	2·0
History of compulsory education only	2·3*	1·3
Occupational histories:		
Plasterer or construction worker	1·2	2·0
Carpenter, joiner, furniture worker, or other woodworker	2·9*	2·0
Worker in boot and shoe industry, textile industry, and tailor	2·0	1·0
Farmer	1·3	1·1
Current or past smoking habits	3·0*	1·6
Domestic heating systems:		
Coal heater	0·8	0·4
Oil heater without chimney	1·4	1·0

*$p < 0·05$.

response rates were relatively high.

Correlation analyses showed that for the male controls a history of compulsory education only was associated with an occupational history of being a carpenter, joiner, furniture, or other woodworker ($\chi^2 = 6{\cdot}15$, df = 1) and that is also correlated with smoking habits ($\chi^2 = 5{\cdot}65$, df = 1) but that no other items were mutually associated with each other.

The data indicate that a history of chronic sinusitis or nasal polyps, an occupational history of woodworking, and current or past smoking habits were the risk factors for developing squamous cell cancer of the maxillary sinus in men. In women, however, no single item was shown to be a statistically significant risk factor.

Discussion

Several papers have been published since 1980 on the epidemiology of nasal sinus cancer.[1-9 11-20] Occupations at risk include users of cutting oils,[11] miners,[13] woodworkers,[5 11 13 15 16] furniture workers,[14 17 20] shoemakers,[12] and leather workers,[13] and these types of work seem to be the major risk factors for the development of this cancer. Some investigators, however, have also shown that a history of nasal disease, such as chronic sinusitis,[4 18] sinus trouble,[20] trauma,[18] or nasal polyps,[20] may be possible risk factors. Smoking has not been regarded as a risk factor[12 14 18] until recently.[8 19 20] It would seem desirable to examine the three possible risk factors simultaneously but this has been done on only a few occasions so far.[5 12 14 16 18-20] The present study is an example of such an investigation.

Of the cancers of the nasal sinus for the three years in Hokkaido, those of the maxillary sinus predominate.The proportion is comparable with those in other parts of Japan, such as Osaka, Miyagi, or Kanagawa, for example, but these Japanese figures are unusually high compared with international rates[1] (men 49·2%; women 47·9%).

Histologically, the predominance of squamous cell tumour of the maxillary sinus in Hokkaido is also observed in Osaka[4] (men 93·2%; women 77·8%) but this proportion is also higher than in the international figures[1] (men 57·4%; women 48·1%) for reasons that are not clear.

Since in Japan households usually have telephones the bias caused by random sampling of community controls using the telephone directory should not introduce serious bias. One problem associated with this sampling method, however, is the proportion of telephone subscribers who are ex-directory. A recent survey in Hokkaido found that only 3·9% of subscribers were ex-directory,[21] and that most of these were single, young girls. Therefore, random sampling using the telephone directory is unlikely to have introduced a serious bias into selecting controls in the present study.

The history of nasal disease was regarded as positive if the subject had been given such a diagnosis more than five years before the time of investigation. This restriction may have precluded the possibility of the cancer preceding the nasal disease. The study of Tola *et al* of all types of nasal sinus cancer[18] included any history of chronic sinusitis regardless of the time of diagnosis and showed a result similar to that of the present study. Brinton *et al*, in a study of cancer of the nasal sinus, suggested that a duration of less than 10 years since the onset of sinus trouble had a relatively small relative risk compared with that of a duration of more than 10 years.[20] As in the present study, they indicated that a history of nasal polyps was a risk factor for the development of cancer of the nasal sinus. Neither our study nor that of Brinton *et al*[20] showed an association between a history of nasal trauma and cancer of the nasal sinus, although such an association was found by Tola *et al*.[18]

Correlation analyses of the various items with the male controls showed that a man having a history of compulsory education only is more likely to have an occupational history of woodworking and that he tends to be a non-smoker. It may be, therefore, that the association between educational history and maxillary sinus cancer is an indirect one and that a history of chronic sinusitis or nasal polyps and a history of woodworking, and smoking habits, are mutually independent risk factors.

The small number of subjects prevented a precise specification of high risk occupations but the results obtained in the present study with regard to occupational risks are comparable with previous findings.[5 11-17 19 20]

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