Dyspepsia in coalminers and the general population: a comparative study

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Coalminers have an increased incidence of gastric cancer^{1,2} with an overall excess mortality of 30-50%, rising as high as fivefold in parts of south Wales.³ If screening for gastric cancer is to be cost effective in the West high risk groups will probably need to be identified and if dyspepsia is to be used to identify a particularly high risk group, such as coalminers, then we must know the rate of dyspepsia in the group we are studying and the extent to which it differs from the general population. We have therefore studied a group of coalminers and an age and sex matched group of subjects from the general population to see if the rates of dyspepsia differ between the two groups with a view to screening this high risk group for gastric cancer.

Patients and methods

A group of 670 coalminers aged 50-75 was identified from the records of the North Nottinghamshire Miners' Pension Fund and a group of 743 age and sex matched non-coalmining subjects was identified from general practitioner records in three participating practices. A self administered questionnaire on upper gastrointestinal symptoms was sent to the subjects in each group with a reply paid envelope. A reminder letter and questionnaire was sent six weeks later to subjects who had not replied.

The signatory of the letter to the miners was the president of the Union of Democratic Mineworkers and for the controls the patient's general practitioner. The letter and questionnaire were kept as simple as possible. The questionnaire included six questions about upper gastrointestinal symptoms: loss of appetite, loss of more than 6 kg in weight, difficulty in swallowing, epigastric pain, heartburn, and vomiting. Also included were inquiries about previous gastric surgery and use of tobacco (including tobacco chewing in the questionnaire to the miners). The relative proportions of each of the responses were compared using the χ^2 test.

Results

Altogether 569 (76.6%) of the general population and 516 (77%) of the miners replied. There was no significant difference in response rate to the questionnaire according to age, taking five year intervals from 50-75 in each group ($\chi^2 = 7.30$, DF = 9, NS). Of those who replied, 195 miners were positive for at least one symptom and 172 were positive in the general population group ($\chi^2 = 5.88$, $p < 0.05$).

Comparing each of the symptoms (table 1), significantly more miners complained of anorexia and weight loss, whereas similar numbers in both groups complained of dysphagia, epigastric pain, heartburn, and vomiting. Significantly more miners had had gastric surgery for benign disease and significantly more miners smoked than the general population. As a corollary of this, there were significantly more ex-smokers in the general population group. Few miners continue to chew tobacco after they retire (14-2.7%) but this habit was common when they worked where 139 (27%) miners took tobacco in this form either solely or in conjunction with smoking (table 2).

Discussion

Most published data (including those of the Registrar General for England and Wales) support the conclusion that coalminers have an average excess mortality for gastric cancer of approximately 50%, rising to fivefold in some regions¹⁻⁶; some studies have failed to show this excess.^{7,8} There have been several hypo-

Table 1 Symptom analysis

Symptom	General population (n = 569)	Miners (n = 516)	χ^2	p
Anorexia	14	43	17.54	<0.001
Weight loss	8	37	21.15	<0.001
Dysphagia	15	25	2.98	NS
Epigastric pain	84	88	0.77	NS
Heartburn	135	138	0.35	NS
Vomiting	25	33	3.45	NS
Previous gastric surgery	25	46	8.47	<0.01

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Table 2 Tobacco habits

Symptom	General population (n = 569)	Miners (n = 516)	χ^2	p
Current smokers	160	201	14.90	<0.01
Ex-smokers	285	215	6.49	<0.05
Tobacco chewers	—	14 (2.7%)	—	—
Ex-chewers	—	139 (27%)	—	—

theses to account for an excess mortality, including an effect of socioeconomic status,² since miners were of social class V earlier this century and this class has a 50% excess for gastric cancer compared with the higher social classes.¹ Other hypotheses relate to the potentially carcinogenic effects of coal dust alone⁹ or after conversion of aromatic coal derivatives to mutagenic nitroso compounds in the stomach.^{10 11}

Another study has shown a positive association between gastric cancer and exposure to coal dust in those miners who smoked.¹² Polynuclear aromatic compounds have been shown to be effective as carcinogens, especially when in particulate form,¹³ whereas statistical associations have been noted in men between atmospheric pollution and coalmining.¹⁴ Significantly more miners complain of anorexia and weight loss than the general population, which may be related to the destabilisation of the gastric mucosa engendered by a lifetime of exposure to the environmental conditions in coalmines, although clearly these symptoms could also be related to the asthenia of chronic respiratory disease that is so common in coalminers. Also relevant in the context of increased risk of gastric cancer is the finding that significantly more miners have had surgery for benign peptic ulcer disease, with an associated increase in the risk of developing a stump carcinoma. Another possible factor resulting in an increased risk of gastric cancer is the more common use of tobacco by coalminers. The carcinogenic effects of smoking on the respiratory tract are well known but the effect of smoking on the stomach is less well known, although there is much circumstantial evidence that smokers are at a higher risk of developing gastric carcinoma. There have also been studies to suggest that unburned tobacco in the form of snuff or chewing tobacco has a carcinogenic effect on gastric mucosa and it is of note that 27% of coalminers in our survey have chewed tobacco.

Other studies have shown that smoking is an aetiological factor for gastric cancer either by itself or more potently when combined with another factor such as exposure to coal dust or the consumption of alcohol.

Although the response rate to our questionnaire was relatively low, there was no evidence that the responding group differed from the non-responders, so it seems unlikely that bias could be introduced as a result of any disparity between the groups. We have found that coalminers complain more frequently of anorexia and weight loss, have a higher prevalence of previous gastric surgery, and have a higher proportion of smokers than an age and sex matched group of the general population. These findings could help to explain the higher incidence of gastric cancer among coalminers and we would suggest that they would be a suitable group to screen for gastric carcinoma using an upper gastrointestinal symptom questionnaire.

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