

Occupational bladder cancer and cigarette smoking in West Yorkshire

by Raymond Cartwright, PhD¹

CARTWRIGHT R. Occupational bladder cancer and cigarette smoking in West Yorkshire. *Scand j work environ health* 8 (1982): suppl 1, 79—82. This paper reports results from a case-referent study on bladder cancer being conducted in parts of West Yorkshire; 991 cases have been incorporated in the results to date. Overall there was a significant risk of bladder cancer associated with smoking cigarettes. This habit showed a risk ratio of 1.8 (95 % confidence limits of 1.5—2.3) for males. In addition there were significant overall risks associated with certain occupations; these include process workers in the dye manufacturing industry, who had a risk of 2.9 (95 % confidence limits of 2.0—4.3) for males. When smokers were contrasted with nonsmokers, however, the risk was 4.6 for dye manufacturing process workers who smoked, while for nonsmokers the risk was much less at 1.9.

Key terms: case-referent study, clerical worker, dye manufacture, dye user, engineer, hairdresser, leatherworker, printer, risk ratio.

Bladder cancer mortality and morbidity are both high in parts of West Yorkshire [unpublished data from the Office of Population Censuses and Surveys and the report of Cartwright et al (2)]. A case-referent study was set up in three hospital districts, Huddersfield with both high mortality and morbidity, Bradford with high morbidity and low mortality and Wakefield with both low morbidity and mortality, to investigate the possible reasons for this phenomenon. The predominant occupations in this region included woollen cloth and yarn manufacturing, dyeing and making of woollen goods, mining, engineering, and chemical dye manufacturing.

The results reported in this paper are the preliminary analysis of the first 1,000 cases of bladder cancer pooled from the three areas described.

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Method and results

Table 1 described the cases and referents included in the present analysis. It represents all the cases prevalent at the onset of the study in October 1978 together with all incident cases occurring since, up to November 1980. Nine known cases present within the study area were not interviewed, and therefore the analysis was directed to 991 cases. All prevalent cases were matched with one hospital referent and all incident cases with two. A portion of the cases also had a neighborhood referent, but the results of this analysis have not been reported in this paper.

The hospital referents were matched with the cases by health district, age, and sex. They were taken from wards which admit patients from that district only and were without malignant disease and chosen by a randomized method from a rotation of wards. The same interviewer interviewed the referents of a particular case, and three interviewers were used whose results were pooled for this report.

The bulk of the analyses were based on the computation of risk using a 2×2 tabular approach, the risks being determined according to Mantel & Haenszel (8) and the confidence limits according to Miettinen (9).

The following information was collected by the interviewers: identification, coffee drinking habits, alcohol drinking habits, smoking habits, saccharin use, past medical history, past drug treatment, occupational history, hobbies, and family history.

Table 2 gives the results of the analysis for cigarette smoking. This analysis took into account the age of the cases, as well as their type of presentation. The resulting risk of 1.8 was statistically significant.

Table 1. Number of cases and hospital referents interviewed in the bladder cancer epidemiology study in West Yorkshire.

	Cases	Referents
Prevalent		
Males	472	468
Females	153	156
Incident		
Males	272	525
Females	94	189
	991	1,338

Table 2. Number of cases and referents and relative risk according to history of cigarette consumption by sex, adjusted for age and type of case.^a

Group	Male cases	Referents	Relative risk	95 % confidence limits
Current smokers	521	564	1.8	1.5–2.3
Never smokers and those who quit > 5 a ago	222	429	1.0	

^a Test for heterogeneity of smoking habits $\chi^2 = 0.74$, $p = 0.17$.

Table 3. Number of cases exposed in various risk occupations.

Occupation	Number of cases	Relative risk ^a	95 % confidence limits
Dye manufacture process worker	65	3.5	2.2–5.3
Leatherworker	8	(1.2)	0.5–3.1
Hairdresser	4	(0.9)	0.3–3.2
Printer	18	3.1	1.4–6.8
Dye user	24	(1.3)	0.8–2.4
Clerical worker	152	1.5	1.1–1.9
Engineer	288	1.5	1.2–1.8

^a Statistically nonsignificant values in parentheses.

Table 3 is a summary of the risks associated with the cases that had worked for at least six months in seven risk occupations. All these results take type of case and sex into account. The chemical industry workers included a preponderance of process workers in the dye manufacturing industry. The leatherworkers were mainly workers in shoe repair shops. Printers were defined as those exposed to ink-fly from high speed presses. Dye users were those involved in woollen dyeing and mainly exposed to wet dyes. Clerical workers included office managers. Engineers included all types of work, but the risk was mainly concentrated on turners, lathe operators, and tool setters.

Table 4 presents a summary of the risk ratios for contemporaneous smokers and nonsmokers in three occupations. The differences between the pair of risk ratios were statistically significant for dye manufacturers but not for dye users or printers.

The process workers in the dye manufacturing industry formed a group of special, although largely historical, interest. Table 5 shows how the age of the worker at the beginning of this type of work influences the subsequent risk of developing bladder cancer. In addition the actual length of employment and the date of be-

ginning the work were both important variables. Table 6 gives the rate ratios by length of employment and year of starting employment.

Discussion

This paper presents a spectrum of data on occupational risks for bladder cancer, together with some results on smoking habits and bladder cancer risks.

The overall relationship between bladder cancer and smoking habits was no surprise (10) although this was the first time such a relationship has been computed for Britain, because the study of Anthony & Thomas (1) found no such risk.

The occupational groups listed in table 3 have all been suggested as risk groups by others, dye manufacturers by Case (3, 4), leatherworkers by Lockwood (7), hairdressers by Dunham et al (6), printers by Young & Russell (11), dye users by Anthony & Thomas (7), clerical workers by Cole et al (5), and engineers by D Acheson (personal communication, 1981).

Dye manufacturers were expected to have a risk, and so the results supported this expectation. Of more interest are the results in table 4 which suggest that non-smoking dye process workers have less risk than their smoking colleagues and that, for smokers, the risk is additive. In addition table 5 seems to suggest that process workers aged 40 and over when they first start that type of employment have little excess risk compared with younger age groups. The basis of this observation is not clear. Table 6 presents the complex data linking year of starting employment and length of service. The dates were chosen to link with technical changes in the processes. These cases do not represent all individuals who ever acquired bladder cancer since 1960, and the results will be modified as new cases arise. Nevertheless this figure shows that a "dose-response" effect is in operation, particularly in the oldest group of workers who were first employed prior to 1940.

The leatherworkers and hairdressers showed no risks in this study, but the numbers were very small. Printers are exposed to carcinogenic substances in inks, and so a risk of bladder cancer could be

Table 4. Effects of cigarette smoking on some occupational groups.

Group	Relative risk ^a	
	Smokers	Nonsmokers
Dye manufacturing process workers	4.6	(1.9)
Printers	3.6	(2.3)
Dye users	(1.2)	(0.4)

^a Statistically nonsignificant values in parentheses.

Table 5. Influence of age at the start of process work in the dye manufacturing industry on risk of developing bladder cancer.

Age at the start of employment (a)	Standardized rate ratio ^a
< 30	7.3
30—39	5.2
> 39	1.0

^a Chi (Mantel-Haenszel) = 3.5, $p = 0.001$; the differences are statistically significant.

Table 6. Standardized rate ratios by length of employment and year of starting employment for process workers in the dye manufacturing industry.

Year of starting employment	Length of employment (a) ^a		
	< 10	10—29	≥ 30
Before 1940	2.6	7.9	15.8
1940—1952	2.6	5.3	5.3
1940—1960	0.4	2.0	—

^a The row differences are statistically significant.

expected. The risk was markedly reduced for nonsmokers, but there were very few of them. Dye users surprisingly showed no risk; perhaps they handled diluted dyes which may have been carcinogenic but in such low doses that the magnitude of risk was tiny compared with that of the dye manufacturing process workers. Smoking cigarettes made little difference to this result.

The clerical workers showed a low but significant risk, which needs further investigation; possibly the personal habits or previous employment of clerks is of importance.

Engineering was suggested as a risk occupation after some correlation studies undertaken in England and Wales. The risk seems to be confined to men exposed to hot mineral oils in the past and, because of the numbers involved, it might prove to be one of the major factors currently involved with the etiology of bladder cancer in West Yorkshire. This aspect is being actively pursued.

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