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THE INDUSTRIAL INJURIES ADVISORY COUNCIL

POSITION PAPER 31

Bladder cancer in hairdressers, barbers and textile workers

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Bladder cancer in hairdressers, barbers and textile workers

Position paper 31

Summary

1. This position paper details the review by the Industrial Injuries Advisory Council (IIAC) of the association between bladder cancer and the work of hairdressers, barbers and textile workers.

2. Bladder cancer is already prescribed in relation to work involving exposure to certain aromatic amines, including 1- and 2-naphthylamine, benzidine, auramine, magenta, 4-aminobiphenyl, methylene-bis-orthochloroaniline, orthotoluidine and 4-chloro-2-methylaniline (Prescribed Disease (PD) C23). In this report, IIAC considers whether work in certain other occupations with potential exposure to aromatic amines (hairdresser, barber or textile worker) might be added to the qualifying list for benefit in relation to PD C23.

3. When weighing the case for prescription, IIAC generally seeks robust evidence that the risk of a disease is more than doubled in relation to defined occupational activities and exposures. Following a careful review of the research literature, the Council has concluded that any risk of bladder cancer from work as a hairdresser or barber is likely to fall substantially below this threshold; also, no consistent evidence was found to indicate a more than doubled risk of bladder cancer in textile workers.

4. The Council has therefore concluded that there are insufficient grounds to recommend prescription for bladder cancer in relation to work as a hairdresser, barber or textile worker.

This report contains some technical terms which are explained in a concluding glossary.

Background

5. It has long been known that some aromatic amines cause bladder cancer and it has been suspected that others may also be carcinogenic. The current prescription list (PD C23) recognises the circumstances in which the link with cancer of the urinary tract is best established – for example, certain work giving rise to exposures to, amongst others, 1- and 2-naphthylamine, benzidine, auramine, aminobiphenyl and methylene-bis-orthochloroaniline.

6. In 2012, a working group of the International Agency for Research on Cancer (IARC) reaffirmed the carcinogenicity of benzidine, 4-aminobiphenyl, and 2-naphthylamine to humans (Group 1), and their potential to cause bladder cancer in human beings (IARC, 2012).

7. Prescription for PD C23 is currently framed in terms of qualifying *exposures*, but a large body of evidence has now accrued on associations between bladder cancer and occupations in which exposures to a range of aromatic amines can arise, notably, hairdressers, barbers and textile workers. The Council's Research Working Group therefore conducted a literature review to assess the balance of evidence on the risks of developing bladder cancer for those individuals working in these occupations.

The Industrial Injuries Disablement Benefit Scheme

8. The Industrial Injuries Advisory Council (IIAC) is an independent statutory body that advises the Secretary for State for Work and Pensions in Great Britain and the Department for Social Development in Northern Ireland on matters relating to the Industrial Injuries Scheme. The major part of the Council's time is spent considering whether the list of prescribed diseases for which compensation may be paid should be enlarged or amended.

9. The Industrial Injuries Disablement Benefit (IIDB) Scheme provides compensation that can be paid to an employed earner because of the effects of an industrial accident or a prescribed disease.

The legal requirements for prescription

10. The Social Security Contributions and Benefits Act 1992 states that the Secretary of State may prescribe a disease where s/he is satisfied that the disease:

    i) ought to be treated, having regard to its causes and incidence and any other relevant considerations, as a risk of the occupation and not as a risk common to all persons; and

    ii) is such that, in the absence of special circumstances, the attribution of particular cases to the nature of the employment can be established or presumed with reasonable certainty.

11. In other words, a disease may only be prescribed if there is a recognised risk to workers in an occupation, and if the link between disease and occupation can be established or reasonably presumed in individual cases.

12. In seeking to address the question of prescription for any particular condition, the Council first looks for a workable definition of the disease. It then searches for a practical way to demonstrate in the individual case that the disease can be attributed to occupational exposure with reasonable confidence. For this purpose, reasonable confidence is interpreted as being based on the balance of probabilities according to available scientific evidence.

13. Within the legal requirements of prescription it may be possible to

ascribe a disease to a particular occupational exposure in two ways – from clinical features of the disease or from epidemiological evidence that the risk of disease is at least doubled by the relevant occupational exposure.

Clinical features

14. For some diseases attribution to occupation may be possible from specific clinical features of the individual case. For example, the proof that an individual's dermatitis is caused by his/her occupation may lie in its improvement when s/he is on holiday and regression when the person returns to work, and in the demonstration that they are allergic to a specific substance with which they come into contact only at work. It can also be that the disease *only* occurs as a result of an occupational hazard (e.g. coal workers' pneumoconiosis).

Doubling of risk

15. Other diseases are not uniquely occupational, and when caused by occupation, are indistinguishable from the same disease occurring in someone who has not been exposed to a hazard at work. In these circumstances, attribution to occupation on the balance of probabilities depends on epidemiological evidence that work in the prescribed job, or with the prescribed occupational exposure, increases the risk of developing the disease by a factor of two or more.

16. The requirement for, at least, a doubling of risk follows from the fact that if a hazardous exposure doubles risk, for every 50 cases that would normally occur in an unexposed population, an additional 50 would be expected if the population were exposed to the hazard. Thus, out of every 100 cases that occurred in an exposed population, 50 would do so only as a consequence of their exposure while the other 50 would have been expected to develop the disease, even in the absence of the exposure. Therefore, for any individual case occurring in the exposed population, there would be a 50% chance that the

disease resulted from exposure to the hazard, and a 50% chance that it would have occurred even without the exposure. Below the threshold of a doubling of risk only a minority of cases in an exposed population would be caused by the hazard and individual cases therefore could not be attributed to exposure on the balance of probabilities; above it, they may be.

17. The required epidemiological evidence should ideally be drawn from several independent studies, and be sufficiently robust that further research at a later date would be unlikely to overturn it.

18. Bladder cancer has important non-occupational causes and does not have clinical features that allow attribution to work when it occurs in an occupational context. The case for prescription, therefore, rests on reliable evidence of a doubling or more of risk of the disease in exposed workers - in the context of this enquiry, bladder cancer and the work of hairdressers, barbers and textile workers, after allowance for other non-occupational risk factors.

19. The Council's search of research abstracts (from 1990 to 2012) identified many original reports and several reviews on hairdressing and bladder cancer. Among these, Harling et al (2010) summarised the findings of 42 studies, Reulen et al (2008) of 29 studies, and Takkouche et al (2009) of 247 investigations. Risk estimates tended to be elevated, but only in the range of 1.2- to 1.7-fold, with most reports towards the lower end of this range. The meta-estimate by Takkouche, for example, was 1.30 (95% confidence interval (95% CI) 1.20 to 1.42), and that by Reulen was 1.23 (95% CI 1.11 to 1.37).

18. A further analysis of 11 studies from six EU countries produced a pooled estimate of relative risk (RR) among 700 men and 2,425 women of 0.8 (95% CI 0.4 to 1.7) (Mannetje et al, 1999).

19. The Council also reviewed national mortality statistics for England and Wales during 1979-1990 and 1990-2000, based on the Registrar General's Decennial Supplement analyses. Deaths from bladder cancer in hairdressers were close to that expected by age and social class.

20. Set against these generally reassuring findings were a few reports indicating higher levels of risk, notably, three case-control studies from New Zealand (Dryson et al, 2008), Germany (Golka, 2008) and Canada (Gaertner et al, 2004); a cohort study of cancer incidence in male barbers from Sweden (Czene et al, 2003); and a cancer registry linkage study from Denmark (Lynge et al, 1988). RR in these studies were elevated by 2- to 9-fold.

21. In 1990, a working group of the IARC noted a small but consistent, increased risk of bladder cancer in male hairdressers and barbers, but little evidence of a dose-response relationship by duration or period of exposure. It considered that data provided only limited evidence of carcinogenicity and classified occupational exposures of hairdressers and barbers as "probably carcinogenic to humans" (Group 2A). Fresh evidence since then has done little to alter conclusions regarding the likely magnitude of risk.

Evidence considered - Textile workers

22. A number of epidemiological studies have also reported excess risks of bladder cancer in textile workers (Dryson et al, 2008) and an IARC Monograph from 1990 concluded that working in textile manufacturing entails exposures that are possibly carcinogenic to humans (Group 2B) (IARC, 1990).

23. A number of more recent studies have also reported increased risks. The Council's review considered 25 reports from 1990 onwards, as

well as a review of 27 studies by Yamaguchi et al (1991) and a further pooled analysis from 11 studies in six EU countries by Mannetje et al (1999).

24. Most estimates of RR were less than 2.0, including three studies from the UK which did not approach this threshold, namely those by Newhouse, 1978, (RR 1.1, dyers, bleachers, textile worker union members), Cartwright ,1982, (RR 1.3, dyers) and Coggon et al, 1986, (RR 1.3, textile workers overall); and in the meta-analysis by Mannetje et al, the RR was 0.9 overall in spinners, weavers, knitters and dyers, and not doubled even in workers exposed for more than 25 years. By contrast, a RR of 2.32 was reported for textile printing and dyeing in another British case-control study (Sorahan et al; 1998), although findings were not statistically significant.

25. Higher RRs and Odds Ratios (OR) were also reported in several case-control studies from before 1990 (Wynder et al, Maffi et al, Gonzales et al, Risch et al), and in selected groups since, although findings by job title have not been consistent. Thus, for example, the review by Yamaguchi et al (1991) highlighted a more than doubling of risk in dye workers, but a review by Mastrangelo et al (2002) reported a RR of 1.39, while risks were decreased among dye workers from Manchester (Morrison et al, 1985) and from Italy (Becherini et al 1991); long-serving winders, warpers and weavers had a more than doubled risk in a Spanish case-control study (Serra et al 2000, 2008), but risks were not so elevated in other reports (Zheng et al, 1992, Mannetje et al, 1999).

26. The Council has also considered mortality from bladder cancer for England and Wales during 1979-1990 and 1990-2000, as reported in the Registrar General's Decennial Supplements. For the last of these two periods, the RR in male preparatory fibre workers was elevated 2.6-fold, although the estimate was based on only two deaths nationally; the RR was lower (1.29) during the earlier period, and other

RRs in specific occupational groups (male warp preparers, weavers, bleachers, dyers and finishers) across both periods did not exceed 1.27. For a condition that is often treatable, like bladder cancer, mortality statistics will provide an insensitive indication of risk. However, these findings provide a further degree of assurance that risks in the UK are not that great relative to the usual threshold for prescription.

Summary and conclusions

27. Before recommending prescription within the terms of the Industrial Injuries Scheme, the Council normally seeks consistent evidence that the risk of a particular outcome is more than doubled in a group with well-defined exposure relative to a suitable comparator population. Most reports of bladder cancer in barbers and hairdressers indicate a level of risk substantially below this threshold. On this basis, the Council feels unable to recommend prescription of bladder cancer in hairdressers or barbers.

28. Similarly, for textile workers, there is a lack of consistent evidence to indicate a more than doubling of risk for bladder cancer from occupation. IIAC has, therefore, decided against recommending prescription in relation to bladder cancer and work in the textile industry.

29. The terms of prescription for PD C23 (occupational bladder cancer), which provide for compensation in relation to cancers of the urinary tract and exposure to a number of aromatic amines, remain appropriate, and therefore should stay unchanged. A watching brief will be maintained on risk by occupational title in case further evidence emerges.

Prevention

30. The Control of Substances Hazardous to Health Regulations 2002 (as amended) (COSHH) apply to the use of hazardous substances, including those contained in dyes and other products used by hairdressers, barbers and workers in the textile industry. COSHH requires that employers undertake a suitable and sufficient assessment of the risks created by work involving hazardous substances. Employers should prevent exposure by substituting the substance or process with safer options or by totally enclosing the work process. Where this is not feasible, exposure should be controlled to as low as reasonably practicable using work processes/systems, engineering controls and other measures, including local ventilation systems, or – as a last resort – suitable personal protective equipment (PPE). Workers should also be informed of the hazards/risks and be provided with relevant training.

31. It may be appropriate to monitor hairdressers and barbers for conditions such as dermatitis which are commonly found in this sector. Health surveillance of hairdressers, barbers and textile workers is unlikely to be undertaken by employers on the basis of cancer risk.

Diversity and equality

32. IIAC is aware of issues of equality and diversity and seeks to promote these as part of its values. The Council has resolved to seek to avoid unjustified discrimination on equality grounds, including age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, gender and sexual orientation. During the course of the review of bladder cancer in hairdressers, barbers or textile workers, no diversity and equality issues became apparent.

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Glossary

Types of study

Case-control study: A study which compares people who have a given disease (cases) with people who do not (controls) in terms of exposure to one or more risk factors of interest. Have cases been exposed more than non-cases? The outcome is expressed as an *Odds Ratio*, a form of *Relative Risk*.

Cohort study: A study which follows those with an exposure of interest (usually over a period of years), and compares their incidence of disease or mortality with a second group, who are unexposed or exposed at a lower level. Is the incidence rate higher in the exposed workers than the unexposed/less exposed group? Sometimes the cohort is followed forwards in time ('prospective' cohort study), but sometimes the experience of the cohort is reconstructed from historic records ('retrospective' or 'historic' cohort study). The ratio of risk in the exposed relative to the unexposed can be expressed in various ways, such as a *Relative Risk*.

Record linkage study: A study of risks to individuals where the study brings together the information contained in two or more separate sources of records". The data, which might be a person's occupation and their registered cancer status, are typically linked through a personal identifier that is unique to them (e.g. national health service number) and common to the records to be linked.

Measures of association

Statistical significance and P values: Statistical significance refers to the probability that a difference as large as that observed, or more extreme still, could have arisen simply by chance. The smaller the probability, the less likely it is that the difference can be explained by chance alone, rather than being a real difference. By convention, when this probability is less than 5% ($p < 0.05$) a difference is described as being "statistically significant". Significance tests only describe association. Statistically significant associations are not

necessarily causal and can arise due to bias or confounding (see below).

Relative Risk (RR): A measure of the strength of association between exposure and disease. RR is the ratio of the risk of disease in one group to that in another. Often the first group is exposed and the second unexposed or less exposed. *A value greater than 1.0 indicates a positive association between exposure and disease*. (This may be causal, or have other explanations, such as bias, chance or confounding.)

Odds Ratio (OR): A measure of the strength of association between exposure and disease. It is the odds of exposure in those with disease relative to the odds of exposure in those without disease, expressed as a ratio. For rare exposures, odds and risks are numerically very similar, so the OR can be thought of as a Relative Risk. *A value greater than 1.0 indicates a positive association between exposure and disease*. (This may be causal, or have other explanations, such as bias, chance or confounding.)

Other epidemiological terms used in this paper

Confidence Interval (CI): The Relative Risk reported in a study is only an *estimate* of the true value in the underlying population; a different sample may give a somewhat different estimate. The CI defines a plausible range in which the true population value lies, given the extent of statistical uncertainty in the data. The commonly chosen 95%CIs give a range in which there is a 95% chance that the true value will be found. *Small studies generate much uncertainty and a wide range, whereas very large studies provide a narrower band of compatible values*.

Meta-analysis: A statistical process of pooling quantitative information across studies to produce an overall estimate of Relative Risk (meta-RR), taking account of their differing sizes.

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