

Self-reported occupational skin contact with cleaning agents and the risk of disability pension

HELENE FEVEILE, KARL BANG CHRISTENSEN AND MARI-ANN FLYVHOLM

The National Research Centre for the Working Environment (NRCWE), Lersø Parkallé 105,
DK-2100 Copenhagen, Denmark

Background: Occupational skin diseases often affect the hands and can lead to consequences at both the individual and the social level.

Objectives: To investigate and quantify the association between self-reported occupational skin contact with cleaning agents and subsequent transition to disability pension.

Methods: A sample of 8337 employees between 18 and 59 years of age participated in the Danish Work Environment Cohort Study in 1990, 1995, or 2000. They were followed up regarding disability pension until 2006 using the DREAM register on social transfer payments for all inhabitants in Denmark. The Cox proportional hazards model was used to estimate the impact of occupational exposure to cleaning agents on subsequent disability pension.

Results: Among women, 11% of the disability pension cases were attributable to exposure to cleaning agents and/or disinfectants.

Conclusions: The study suggests a potential for prevention of work-related disabilities among job groups exposed to cleaning agents.

Key words: aetiologic fraction; care workers; cleaners; cleaning agents; disability pension; occupational skin diseases; occupational skin exposure. © Blackwell Munksgaard, 2009.

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Occupational skin diseases often affect the hands and are among the most frequent work-related diseases in many western, industrialized countries. The 1-year prevalence of hand eczema in the general population has been estimated to about 10%, and in occupations involving wet work or exposure to irritants or allergens, the occurrence is much higher. Severe hand eczema is often a chronic relapsing condition with a poor prognosis (1).

Hand eczema can, in addition to the discomfort and limitations due to the skin disease, affect the individual in terms of sick leave (2), cause impaired quality of life (3–5), and even having to leave one's profession before time (6). On the societal level, the consequences include payments of sickness benefits and loss of production (7, 8).

Occupational cleaning work is unskilled and heavy physical work. The cleaning trade faces challenges related to both the physical and the

psychosocial work environment. Cleaning work entails exposures of both ergonomic and chemical nature. Awkward working postures and repetitive work tasks can lead to physical disability. Working with wet hands and cleaning agents, which may contain contact allergens, can lead to skin irritation and eczema (9–11).

Due to the incipient shortage of labour in Denmark, identification of factors associated with early retirement is of importance for economic reasons as well as for individual reasons. Albertsen et al. (12) provided an overview of demographic, lifestyle, and work environmental risk factors for disability pension in Denmark. The present study is based on an expansion of these data and a refinement of the methods used in that study and investigates and quantifies the association between occupational exposure to cleaning agents and subsequent transition to disability pension.

Methods

This study is based on a merger of survey data about the work environment from the Danish Work Environment Cohort Study (DWECS) and information about granted disability pension from the national register DREAM, an administrative register holding weekly information of social transfer payments for all inhabitants in Denmark (13).

DWECS is a national survey of work environment and health conducted every fifth year (14). DWECS has a split panel design: On 1 October 1990, a simple random sample of inhabitants of Denmark between 18 and 59 years of age was drawn from the Danish centralised civil register. On 1 October 1995, additional samples were drawn to adjust for immigration and for the ageing of the 1990 panel. These were simple random samples of inhabitants of Denmark who did not live in Denmark exactly 5 years before and of persons between 18 and 22 years of age. The size of each sample reflects the proportion of the relevant groups of the total population. The three samples constituted the 1995 panel and persons in this panel were contacted irrespectively of participation in the previous wave. In 2000, supplementary samples were drawn and interviews were conducted according to the same principles as just described. In each of the three waves, people who had been employees within 2 months prior to the interview were interviewed about working conditions, occupational exposures, and health behaviour. The 1990 sample consisted of 9653 people of whom 8664 (90%) participated, 5701 of these were employees. The combined 1995 sample consisted of 10 702 people of whom 8583 (80%) participated, 5369 of these were employees. The combined 2000 sample consisted of 11 437 people of whom 8583 (75%) participated, 5366 of these were employees. Only questionnaire items appearing in all three waves of DWECS were available for this analysis.

The exposure was assessed using a single item 'Are you subjected to skin contact with cleaning agents and/or disinfectants?' with six response categories: 'Almost all working hours', '¾ of working hours', '½ of working hours', '¼ of working hours', 'Seldom', and 'Never'. Those reporting exposure in one fourth of working hours or more were categorized as exposed, whereas those responding 'Seldom' or 'Never' were categorized as unexposed.

Body mass index (BMI) was calculated from self-reported weight and height and categorized according to the standard classification of the National Institutes of Health (BMI < 18.5, under-

weight; BMI 18.5–24.9, normal; BMI 25–29.9, overweight; and BMI ≥ 30, obese). The population was divided into heavy smokers (15 cigarettes or more per day), moderate smokers (less than 15 cigarettes per day), ex-smokers, and non-smokers.

Physical demands and body posture were assessed using three questions on physically hard work ('Is your work so physically hard that you breathe faster?'), working with hands above the shoulders ('Do you work with your hand lifted to shoulder height or higher?'), and working in a squatting or kneeling position ('Does your work imply that you squat or kneel?'). The response categories were identical to those in the question about cleaning agents, and dichotomisation was done in the same way.

The Cox proportional hazards model was used to estimate the impact of occupational exposure to cleaning agents on subsequent disability pension (no information about the underlying diagnosis for disability pension was accessible). Persons were followed in the DREAM register from the time of their first DWECS interview and were censored at the time of their 60th birthday, emigration, death, or end of follow-up (18 June 2006). Those participating in a later interview were followed again from the time of the later interview with updated exposure and confounder information. Those not participating in later interviews were followed with the existing exposure and confounder information, but the age variable was updated. In total, 8475 employees, 4187 women and 4288 men, were eligible for inclusion in this study, 3191 who participated in one interview, 2607 who participated in two interviews, and 2677 who participated in three interviews.

Effects were adjusted for age, smoking habits, and BMI and in a supplementary analysis also for physical demands and body postures. The relative contribution of occupational exposure to cleaning agents can be determined by calculating the aetiologic fraction, which is defined as the fraction of the outcome that was caused by a specific predictor (15).

Results

A total of 4116 women and 4221 men without missing data who were employees and younger than 60 years at the time of interview were included in this study. The total follow-up time constituted 58 338.48 and 60 264.47 person years of risk time for women and men, respectively. During the follow-up time, 452 of these employees were granted early retirement pension: 265 women and 187 men. Table 1 shows hazard ratios and

Table 1. The impact of skin contact with cleaning agents and/or disinfectants on the risk for disability pension: estimated HR and 95% CI^a

		Total risk time (person years)	Events	HR (95% CI)
Women	Contact with cleaning agents	7323.88	59	1.97 (1.47–2.63)
	No contact with cleaning agents	51 014.60	206	1.00
	Total	58 338.48	265	
Men	Contact with cleaning agents	3853.37	12	1.08 (0.60–1.94)
	No contact with cleaning agents	56 411.10	175	1.00
	Total	60 264.47	187	

CI, confidence intervals; HR, hazard ratios.

^aEffects are adjusted for age, smoking habits, and body mass index. Figures in bold indicate p-values <5%.

95% confidence intervals (CI) for disability pension controlled for age, smoking habits, and BMI for each sex.

Among women, self-reported skin contact with cleaning agents and/or disinfectants was associated with disability pension, while very few men reported the exposure and no significant effect was seen. Further consideration of physical demands

and body posture did not alter the conclusions, although the association was slightly weakened among the women. The estimated hazard ratio was 1.73 (95% CI 1.27–2.34).

The relative contribution of occupational exposure to cleaning agents to the outcome is estimated by the aetiological fraction, illustrated in Fig. 1. The width of the columns in the histogram corresponds to the proportion of participants in the group and the height reflects the hazard ratio. The area of the column represents the amount of disability pension in the group, and the shaded area above the line parallel to the top of the first column represents the disability that would not have occurred if both groups had had the same disability rate. The aetiologic fraction is calculated by dividing this area by the total area.

Among women, 11% (95% CI 6–17%) of the disability pension cases were attributable to reporting of skin contact with cleaning agents and/or disinfectants. Based on the model conditioned on physical demands and body postures as well, 8% (95% CI 3–14%) of the disability pension cases among the women were attributable to skin contact with cleaning agents and/or disinfectants.

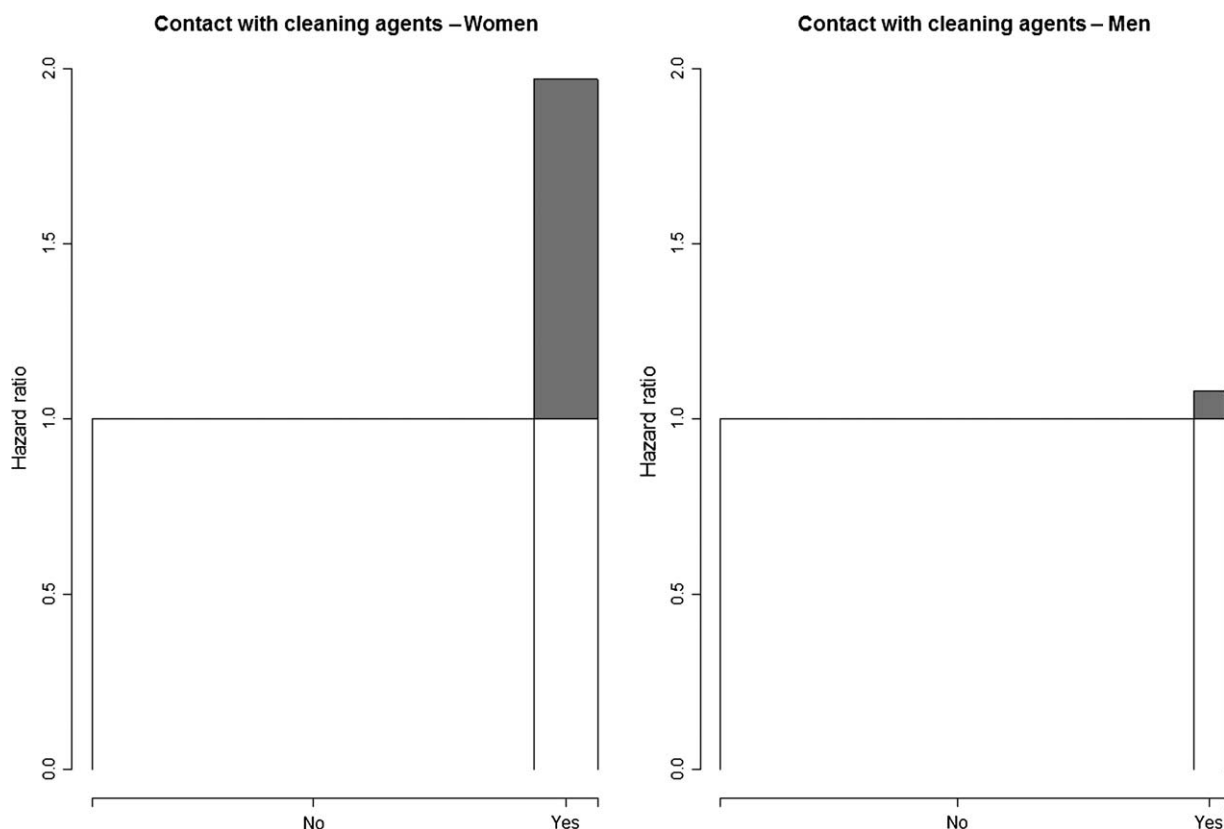


Fig. 1. The relative contribution of reporting occupational skin contact with cleaning agents to disability pension cases (the aetiological fraction). Column width corresponds to the proportion of participants in the group and the height reflects the hazard ratio.

For each of the three cross-sections in DWECS, participants were categorized according to job. Not surprisingly, cleaners had the highest level of exposure in all waves, with around 60–70% being categorized as exposed. Care workers (in hospitals, nursing homes, and home care) were also highly exposed, with 20–40% exposed over the three waves. Kitchen staff, doctors, dentists, and food industry workers also reported exposure levels around 20% in the period (data not shown).

Discussion

This study identified self-reported skin contact with cleaning agents and/or disinfectants as a risk factor of future disability pension among women.

The strength of this study is in the prospective design, the long follow-up period, and the time-varying assessment of exposure and confounders. Assessing granted disability pension by linking to an administrative register is also a strength (13).

An overall weakness of the study is the requirement of unaltered exposure and confounder questions throughout the three waves of DWECS that leaves a somewhat abridged series of questions for analysis. A specific weakness is that the question used for assessing skin contact with cleaning agents has not been validated in a Danish population. In general, very few questions on skin exposure have been validated. A Dutch group made a validation study comparing self-reporting in questionnaires and workplace observations on duration and frequency of wet work in nurses. According to the observations, the questionnaire method overestimated the duration (about double) and underestimated the frequency (half) (16). A Swedish study validated self-reporting of skin exposure by observations in different high-risk occupations. The correlation was strong for duration of exposure to water, foodstuffs, and protective gloves and moderate for hand washing (times per day). The questionnaires tended to overestimate the duration of exposure (17). In the present study, the fact that around 20% of doctors and dentists report skin contact with cleaning agents and/or disinfectants during at least one quarter of working hours suggests that duration might also be overestimated here. Because this specific question has not been validated in a comparable population, we will refrain from *post hoc* speculations.

Our results are in line with other studies. Among the job groups reporting most skin contact with cleaning agents were cleaners, care workers, and kitchen staff (predominantly female job groups). This is compatible with the industries identified as having high risks of disability retirement by Hannerz et al. (18). In a Danish follow-up study on

cleaners conducted in 1989 and 1991, more cleaners in the group with skin problems in 1989 had left the job at follow-up (19). A Swedish follow-up study on cases of notified occupational skin diseases showed changes in the occupational situation for more than 80% and that 15% had left the labour market due to unemployment or disability pension (20).

Disability retirement rates differ between industries, and it has been estimated that roughly 38–40% can be attributed to non-optimal work environments (18). Quantification of the effect of risk factors is useful in a prioritization debate, and according to the present study, 11% of the disability pension cases among women were attributable to exposure to cleaning agents and/or disinfectants. Some of the job groups reporting a high degree of skin contact with cleaning agents also report high degrees of physical demands and/or body postures, but control for physical demands and body postures did not eliminate the association between disability pension and skin contact with cleaning agents and/or disinfectants. To what extent this association can be ascribed to skin contact with cleaning agents and/or disinfectants in itself, or if it serves as a proxy for identifying job groups with a cocktail of strenuous occupational exposures, cannot be assessed from this study. It is a weakness of the design that DREAM does not include information about the underlying diagnosis for disability pension, precluding focussing on occupational skin diseases.

In conclusion, exposure to cleaning agents and/or disinfectants may contribute to the increased rate of disability pension in the cleaning trade. This suggests a potential for prevention of work-related disabilities among job groups exposed to cleaning agents.

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- Address:
Mari-Ann Flyvholm, MSc, PhD
The National Research Centre for the Working Environment (NRCWE)
Lersø Parkallé 105
DK-2100 Copenhagen
Denmark
Tel: +45 3916 5280
Fax: +45 3916 5201
e-mail: maf@nrcwe.dk