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Major Article

Latex glove use among healthcare workers in Australia

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Background: Exposure to natural rubber latex, primarily through the use of gloves, is a well-recognized cause of occupational asthma. We investigated latex glove use among Australian workers and estimated the resultant burden of occupational asthma among healthcare workers (HCWs).

Methods: Data were collected in 2014 as part of the Australian Work Exposures Study-Asthma, a telephone survey investigating the prevalence of current occupational exposure to asthmagens, including latex. We estimated adjusted prevalence ratios (aPRs) to determine variables associated with the use of latex gloves among HCWs and calculated the asthma-related disability-adjusted life years due to latex exposure among HCWs.

Results: Latex gloves were used by 22% of respondents. Almost two-thirds (63%) of HCWs reported wearing latex gloves, with 26% using powdered latex gloves. The use of latex gloves was more common among those employed in micro companies (less than 5 employees) than large companies (200+ employees) (aPR = 1.5, 95% confidence interval 1.1-2.0). Latex exposure in HCWs was estimated to contribute 3% of the total asthma-related burden.

Discussion: Latex gloves are widely used by Australian workers and by HCWs in particular.

Conclusions: This is the first estimate of the burden of asthma attributable to occupational exposure to latex among HCWs. These results can be used to guide decisions regarding the control of occupational exposure to latex.

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BACKGROUND

Natural rubber latex is a well-recognized allergen and is commonly associated with contact dermatitis, asthma, and other allergic conditions.¹ The prevalence of latex allergy in the general population has been estimated at 4% and is much higher among particular groups of workers, such as healthcare workers (HCWs), with around 10% of HCWs thought to be sensitized.^{2,3} Accordingly, latex exposure is one of the main causes of occupational asthma in developed countries.^{1,4}

A major source of exposure to latex, particularly among HCWs, is through the use of latex gloves.¹ Gloves are primarily used as a barrier against infections and contaminants,⁵ with their use in-

creasing in the 1990s due to rising concerns about blood-borne viral infections.⁶ Latex gloves are the preferred choice of glove for many workers,⁵ with a British study finding that 47% of medical practitioners preferred latex over other types of gloves due to their comfort and improved dexterity.⁷ Limited data exist regarding the prevalence of use of latex gloves, particularly in Australia, although 1 study found that 85% of HCWs undertaking wet work were provided with disposable latex gloves.⁸ Latex gloves are also used by many other workers in Australia, including hairdressers and food handlers.^{6,9}

The use of powder-free latex gloves may be an effective way to reduce latex exposure and sensitization in the workplace. Powders such as corn-starch are commonly used to lubricate latex gloves, which have a naturally adherent surface when untreated.⁵ However, these powders also have a high affinity for latex proteins and can therefore act to increase airborne allergens, particularly during the donning and removal of gloves.¹⁰ Substitution of powder-free for powdered latex gloves has been shown to decrease the presence of latex allergens as well as reduce sensitization and asthma symptoms in workers, including HCWs.^{4,11} The use of powder-free gloves,

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particularly in HCWs, is recommended by the National Health and Medical Research Council in Australia,¹² while powdered latex gloves have been banned in other countries, including Germany.¹ However, policies regarding the use of latex gloves, both powdered and powder-free, vary among Australian healthcare facilities.

This study investigated the prevalence of use of both powdered and powder-free latex gloves across the Australian working population, with a particular focus on their use by HCWs, since they have been identified as a population at high risk of latex sensitization.¹⁴ It also estimated the burden of occupational asthma resulting from the use of latex gloves among Australian HCWs.

MATERIAL AND METHODS

Data for this study were collected as part of the Australian Work Exposures Study (AWES)-Asthma. AWES-Asthma was a cross-sectional telephone survey conducted in 2014 to investigate the prevalence of current occupational exposure to 27 groups of asthmagens, including latex, among the Australian working population. Ethics approval for this study was obtained from the [redacted for review] Human Research Ethics Committee. Full details of the methodology have been published elsewhere.¹³

In brief, Australian residents between 18 and 64 years of age who were currently employed were eligible to participate. Informed consent was presumed by the approval to continue with the survey questions after a description of the study. Using computer-assisted telephone interviews, all participants ($n = 4878$) were asked to provide basic demographic information, including age, sex, country of birth, and highest level of education completed, as well as occupational information, including the size of the company for which they worked and whether they had any managerial or supervisory duties. We derived socioeconomic status (according to the Socio-Economic Indexes for Areas disadvantage score)¹⁴ and remoteness of residence (according to the Accessibility/Remoteness Index of Australia)¹⁵ from respondents' residential postcodes. We also collected preliminary information on respondents' current job to determine whether the job was unlikely to be exposed to asthmagens (e.g., office and clerical workers and customer service workers; $n = 2255$ classified as unexposed).

For the remaining 2623 workers, additional information regarding their current job was collected and used to assign 1 of 53 job-specific modules (JSMs) using the web-based tool OccIDEAS.¹⁶ Each JSM contained questions about specific tasks that had been identified as potential determinants of exposure to 1 or more of the asthmagens groups.

Fifty-two of these JSMs (all excluding Driver) included a standard set of questions related to glove use. These questions collected information regarding the use of gloves while working, the type of gloves worn (including latex), the presence of powder on the inside of the gloves, and the frequency with which gloves were worn (defined as rarely, half of the time, most of the time, always, or only during specific tasks). Where respondents could not identify the type of gloves worn, they were asked whether the gloves were "stretchy and creamy white in color" in an attempt to ascertain whether the gloves were made from latex. A total of 2476 respondents answered these questions.

At the completion of data collection, each job was coded according to the Australian and New Zealand Standard Classification of Occupations (ANZSCO)¹⁷ and then categorized into 1 of 24 occupational groups determined to be relatively homogenous with regard to the relevant tasks undertaken and hence potential for exposure to asthmagens. Two members of the study team independently grouped the occupations, and any differences between these 2 members were resolved by discussion.

All analyses were performed using Stata v14 software.¹⁸ Prevalence of latex glove use was extrapolated to the Australian working population with reference to the 2011 Census¹⁹ to provide an estimate of how many workers in Australia are likely to use latex gloves in their current jobs. Since our sample has previously been found to be non-representative in terms of age, remoteness, and manager/other occupation (for men only),¹³ extrapolations were weighted by age group and remoteness (and manager/other for men) and stratified by sex.

For this article, we also conducted a supplementary analysis restricted to those assigned an ANZSCO code identifying them as HCWs ($n = 411$, 8.4% of final sample). For the purposes of this analysis, HCWs included allied health workers (e.g., pharmacists and physiotherapists), carers (e.g., personal care attendants, nursing support, and personal care workers), medical laboratory scientists, and nurses and other medical personnel (e.g., dental practitioners, general practitioners, and surgeons) (see [Supplementary Table S1](#) for a full list of included ANZSCO codes). Adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs) were estimated using modified Poisson regression models incorporating the robust sandwich variance²⁰ to determine which, if any, demographic and occupational variables were associated with the use of latex gloves among HCWs. The demographic variables of sex, age group, country of birth (Australia/other), highest level of education, socioeconomic status, and remoteness of residence, as well as the occupational variables of occupational group, company size, and manager status, were adjusted for in all such analyses.

We then calculated the asthma-related disability-adjusted life years (DALY) due to occupational exposure to latex among HCWs. We first calculated the weighted years lived with disability (YLD) due to asthma as a function of the number of prevalent asthma cases and a disability weight. The disability weight (0.054) was derived from the 2003 Australian Burden of Disease and Injury report,²¹ while the number of prevalent cases by 10-year age group was obtained from the National Health Survey 2014-15.²² We then calculated the years of life lost (YLL) to premature mortality as a result of asthma by multiplying the number of deaths due to asthma in 2014 (obtained from the General Record of Incidence of Mortality maintained by the Australian Institute of Health and Welfare²³) by the life expectancy at the age of death (using the life tables for 2013-15 obtained from the Australian Bureau of Statistics²⁴). Both YLD and YLL were calculated separately by sex and restricted to ages 18-64 (considered the working population for our purposes). We then summed the YLD and YLL to derive the DALY due to asthma.

Finally, we derived the population-attributable fraction (PAF), or the proportion of asthma cases due to occupational exposure to latex among HCWs, using Levin's formula.²⁵ The proportion of the population who were latex glove-wearing HCWs (i.e., the proportion of the population exposed) was derived from AWES-Asthma, while the relative risk of asthma from latex exposure among HCWs was derived from a meta-analysis conducted by Bousquet et al. (odds ratio = 1.55, 95% CI 1.15-2.08).⁴ The PAF was then multiplied by the DALY to obtain the burden of asthma due to occupational exposure to latex among HCWs. We also conducted a secondary PAF analysis restricted to those HCWs who reported only wearing latex gloves and doing so at a high frequency (defined as "always" or "most of the time").

RESULTS

Of the 4878 respondents, 1710 (35.1%) reported wearing gloves at work. Latex gloves were the most frequently reported type of glove worn and were used by 1057 respondents (21.7% of total), with 49.8% of these ($n = 526$) reporting exposure to powdered latex gloves. Other glove types worn included leather ($n = 341$, 7.0%), nitrile ($n = 228$,

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