

Self-reported allergy to latex gloves among health care workers in Jordan

YOUSSEF KHADER¹, MAISOUN ABU-ZAGHLAN², ISSAM ABU-AL RISH², SAMAR BURGAN³ AND ZOUHAIR AMARIN⁴

¹Department of Public Health and Community Medicine, ²Faculty of Dentistry, Jordan University of Science and Technology, Irbid, ³Department of Oral Medicine, University of Jordan, Amman, and ⁴Department of Obstetrics and Gynecology, Jordan University of Science and Technology, Irbid, Jordan

The objective of this study is to determine the prevalence of natural rubber latex allergy and its associated factors among health care workers in Jordan based on a self-administered questionnaire. In this cross-sectional study, the data were obtained through a self-reported hand-delivered questionnaire that was distributed to 500 health care workers who use natural rubber latex gloves. A total of 420 (84%) health care workers responded by filling the questionnaire. Of the total number of 420 health care workers who filled the questionnaire, 57 (13.6%) reported allergy to latex gloves. The prevalence of allergy to latex gloves was significantly higher for those who had allergy to some foodstuffs (especially avocado, kiwifruits and chestnuts) or with history of eczema and hay fever. However, allergy to latex gloves was independent of gender, age, job, family history, type of gloves, hours of use/day and number of years of use. It is concluded that a high rate of allergy to latex gloves was reported among health care workers in Jordan.

Key words: Allergy, gloves, latex. © Blackwell Munksgaard, 2005.

Accepted for publication 25 August 2005

The use of natural rubber gloves by health care workers has increased dramatically in the past 2 decades. This has primarily been for the prevention of HIV as a transmissible agent. Latex used in glove manufacturing is derived from the *Hevea brasiliensis* plant which contains some powerful allergens. Chemicals used in the manufacturing and sterilizing process of gloves may also act as contact allergens (1). The rise in latex glove use has resulted in a latex allergy prevalence of up to 30% that has become a significant problem for health care workers (2–9).

Several parameters have been implicated as possible potentiating factors. The incidence of occupation-related sensitization has been shown to be at its greatest in the first 2 years of exposure (10), with a strong association between the number of gloves used per day and symptoms of latex sensitization (11).

Investigations covering the effect of the duration of exposure to natural rubber latex gloves have produced conflicting results. Some studies have found some positive associations between the duration of latex gloves use and sensitization (2, 3, 12), but other studies have found no such a significant association between the duration of

exposure and latex hypersensitivity (7, 9, 11, 13, 14). Similarly, job title and work location had produced contrasting results. For instance, it had been reported that operating theatre personnel and laboratory workers were at an increased risk of sensitization compared with laboratory personnel or outpatient nurses (15–17). By contrast, other studies have found operating room nurses to be the lowest-risk group among all nursing specialties and laboratory personnel or even lower prevalence of sensitization among operating theatre staff than in any other studies (2). Furthermore, frequent exposures to latex products are statistically significantly correlated with a higher prevalence of latex allergy in health care workers. Statistically significant correlations between leachable protein levels from latex products and allergen content/activity, as assessed by allergen-specific IgE-ELISA inhibition and skin prick testing, were demonstrated in studies of dental students (18).

An association between latex allergy and allergy to various food substances such as avocado, banana, kiwifruit, potatoes, tomatoes and chestnuts has been reported in many studies (19, 20). It has also been reported that individuals

with history of asthma and rhinoconjunctivitis are significantly more likely to develop sensitization to natural rubber latex in the future (16). Atopy has been found to be a strong effect modifier that potentiates the exposure–response curve (21). Subjects with childhood atopy may be at high risk of latex sensitization (22).

Another area of contention had been the allergenic effect of powdered versus non-powdered gloves. On the one hand, some studies had concluded that a reduced use of powdered natural rubber latex gloves is associated with a decrease in cases of occupational contact urticaria (4, 23–26). On the other hand, other studies have found that the prevalence of sensitization was higher among users of powder-free latex gloves than that among users of powdered latex gloves (27, 28).

There are no published data on the magnitude of allergy to latex gloves in Jordan. Therefore, this study was conducted to determine the prevalence of self-reported allergy to latex gloves and its associated factors among health care workers in North Jordan based on a self-administered questionnaire.

Methods

The data were obtained through a self-administered questionnaire that was distributed to a randomly selected 500 health care workers in October 2004. A total of 3580 health care workers were eligible for this study. It included general and specialist physicians, general and specialized dental practitioners, nurses, medical laboratory technicians and dental hygienists from various medical hospitals and dental centres in North Jordan. Workers in the radiology departments, cleaners, workers in the sterilization units and laundrettes were excluded. A total of 420 (84%) health care workers (129 physicians, 50 dentists, 183 nurses, 34 medical laboratory technicians and 24 dental hygienists) agreed to participate and filled the questionnaire. The response rate was 81% for physicians, 83% for dentists, 87% for nurses, 81% for medical laboratory technicians and 86% for dental hygienists.

The questionnaire was constructed by selecting relevant questions from original questionnaires reported in the literature (29, 30). Single forward and backward translations of the selected questions to English were carried out to ensure equivalency. The questionnaire was pilot-tested in a sample of 30 subjects to ensure level of validity and degree of repeatability (Cronbach alpha = 0.85).

The questionnaire included information on sociodemographic characteristics, job title and

duration of working in own given profession. A section of the questionnaire sought information about gloves use including history of exposure to latex gloves and number and type of gloves used (powdered versus non-powdered gloves). Another section sought information about any allergic reactions to latex gloves (Have you ever had an allergic reaction to latex gloves in your work environment?) and length of time since onset, nature of symptoms related to glove use, details on any exacerbation of the latex glove allergy with season changes, personal and family history of any allergic disorders such as asthma, hay fever, eczema or other allergies, information about allergy to certain kinds of food such as banana, avocado, kiwifruit, chestnuts, other nuts, potatoes, tomatoes or other foods and any special precautions taken to minimize latex glove allergy.

The Statistical Package for Social Sciences Software (SPSS, version 11.5, SPSS Inc., Chicago, IL, USA) and Microsoft Office Excel 2003 were used for data processing and data analysis.

Variables were described using frequency distribution. Means and standard deviations were calculated for continuous variables. χ^2 -test was used to assess the association between categorical independent variables and latex glove allergy. *P*-value of <0.05 was considered statistically significant.

Results

This study included 420 health care workers (52.6% males and 47.4% females). Their ages ranged from 21 to 57 years with an average $\pm$ SD of 29.4 ± 7.7 . A total of 241 health care workers were below 30 years of age. The composition of the sample included 30.6% physicians, 12.3% dentists, 43.4% nurses, 8% medical laboratory technicians and 5.7% dental hygienists. Years of experience ranged from 0.25 to 32 years with an average of 6.6 ± 6.7 years (median = 4 years).

A total of 57 (13.6%) participants reported allergy to latex gloves. The prevalence of allergy to latex gloves was higher among males (16.3%) compared to females (10.6%), but this difference was not statistically significant (*P*-value = 0.087). About 13.7% of those who were below 30 years old and 15% of those who were 30 years old or over were allergic to latex gloves. The lowest prevalence was found among laboratory technicians (5.9%), and the highest prevalence was among the nurses (18%). About 14% of the health care workers who used latex gloves for <5 hr/day and 16.5% of those who used them for ≥ 5 hr/day were allergic to latex gloves.

14% of the health care workers who used powdered gloves and 10.4% of those who used powder-free gloves were allergic to latex gloves. The prevalence of allergy to latex gloves was not significantly associated with gender, age, job category, type of gloves, number of hours of use/day and number of years of use (Table 1).

About 27.7% of those who had allergy to any food and 12.3% of those who had no allergy were allergic to latex gloves ($P = 0.026$). However, the prevalence was significantly higher for only those who had allergy to avocado or kiwifruits or chestnuts. Increased prevalence of allergy to latex gloves was significantly associated with eczema ($P = 0.001$), allergy to pollen grains ($P = 0.006$) and asthma ($P = 0.035$). On the other hand, this allergy was independent of family history ($P = 0.486$) (Table 2).

In 60.7% of those who had personal history of atopy, allergy became worse because of using latex gloves. Of those who had allergy to latex gloves, it had started in 47.4% after first exposure, in 28.1% within the first year, in 14% within the second year and in 3.5% within the third year of exposure. However, allergy to latex gloves starting after first exposure should partly or fully be regarded as irritant reactions.

Regarding allergy to latex gloves-related symptoms, the most common symptoms were redness (82.1%) and pruritus (80.4%) (Fig. 1). Of affected individuals, 41.1% suffered from worsening of their symptoms in the summer, 10.7% in the winter, 1.8% in the spring and

48.2% of cases had no interseasonal variation in symptoms.

Regarding precautions taken by affected individuals to minimize symptoms, 29.6% used powder-free gloves, 35.2% used topical creams, 16.7% worked without gloves, 16.6% used nylon gloves under latex gloves and 1.9% washed their hands after work to remove any remnants of powder or glove particles.

Discussion

This cross-sectional study evaluated the prevalence of allergy to latex gloves, gloves-related symptoms and factors contributing to this type of allergy among health care workers in North Jordan. About 13.6% reported symptoms that are related to latex glove use. These data are consistent with those reported by other international studies. The prevalence of latex sensitization has been estimated at around 13% (3, 5, 8, 9, 28), depending on the population studied, the selection criteria and the definition of sensitization used for inclusion in the survey.

Latex glove symptoms were significantly related to positive history of personal atopy. In this study, the onset of allergy to latex gloves was greatest directly after first exposure. However, allergy to latex gloves starting after first exposure should fully or partly be regarded as irritant reactions. Individuals with immediate reactions after first exposure would not have had the time to develop sensitization. A study by Mikkola et al.

Table 1. The prevalence of allergy to latex gloves by demographic variables and latex gloves-related parameters

Variable	Allergic <i>n</i> (%)	Non-allergic <i>n</i> (%)	<i>P</i> -value
Gender			0.087
Female	21 (10.6)	178 (89.4)	
Male	36 (16.3)	185 (83.7)	
Age (years)			0.727
<30	33 (13.7)	208 (86.3)	
≥30	22 (15.0)	125 (85.0)	
Job title			0.098
Physician	11 (8.5)	118 (91.5)	
Dentist	7 (14)	43 (86.0)	
Nurse	33 (18.0)	150 (82.0)	
Dental assistant	4 (16.7)	20 (83.3)	
Laboratory technician	2 (5.9)	32 (94.1)	
Years of use			0.912
<4	25 (13.5)	160 (86.5)	
≥4	26 (13.1)	172 (86.9)	
Hours of use per day			0.515
<5 hr/day	22 (13.8)	137 (86.2)	
≥5 hr/day	26 (16.5)	132 (83.5)	
Type of gloves			0.508
Powdered	40 (13.5)	257 (86.5)	
Powder-free	5 (10.4)	43 (89.6)	
Both	9 (18.4)	40 (81.6)	

Table 2. The prevalence of allergy to latex gloves by various allergy parameters

	Total	Allergic		P-value
		n	%	
History of eczema				0.001
Yes	55	15	27.3	
No	354	39	11.0	
History of pollen grains allergy				0.006
Yes	79	18	22.8	
No	333	37	11.1	
History of asthma				0.035
Yes	16	5	31.3	
No	397	51	12.8	
Family history of allergy				0.486
Yes	163	20	12.3	
No	238	35	14.7	
Food allergy				0.026
Yes	35	9	25.7	
No	375	46	12.3	

(19) demonstrated that the highest incidence of sensitization is in the first 12 months of employment. Gautrin et al. (10) demonstrated that the incidence of occupation-related sensitization was greatest in the first 2 years of exposure and declined to incidence levels similar to those for common allergens after 4 years. The majority of symptoms were mild with very few cases of generalized symptoms such as urticaria, rhinitis and asthma, which are related to IgE-mediated reactions. This substantiates previously reported rates (31, 32). Similar to the findings of other studies, there was no significant association between the duration of exposure and allergy to latex gloves (9, 13, 14). There was no significant association between job title and allergy to latex gloves. By contrast and as previously reported (19, 20), there was a strong association between food allergy and allergy to latex gloves. This type of allergy is significantly related to positive history of common allergy symptoms, and to a positive personal history of atopy. This is in concord with other

studies (12, 16, 21, 22) and may be a useful finding as it would be possible to perform precautionary allergy testing to those with personal history of allergy.

Although a high rate of allergic reactions to latex gloves was reported among health care workers in Jordan, relying on questionnaire data alone to determine the prevalence of allergy to latex gloves has obvious shortcomings. Confirmation of this prevalence rate requires objective measure of IgE-mediated hypersensitivity such as skin testing with appropriate extracts, or *in vitro* assay of specific IgE antibodies to the latex allergens.

From the statistical point of view, the power of this study is considered inadequate to demonstrate that powdered gloves are associated with higher prevalence of allergic reactions than powder-free gloves. However, the use of powder-free, low-protein natural rubber latex gloves has been practised in few institutions to a very good result (24, 25, 32). The recommendation therefore is to adopt the use of this type of gloves to reduce the incidence of allergy to latex gloves in general and to reduce the likelihood of severe allergic reactions in sensitized patients in particular.

Acknowledgements

The authors express sincere appreciation to all health care workers who completed the questionnaire.

References

- Booth B, Thomas L, Thompson G, Raune-Morris M, Lawton S. Glove allergies. *Nursing Times* 1996 (Special Report).
- Turjanmaa K. Incidence of immediate allergy to latex gloves in hospital personnel. *Contact Dermatitis* 1987; 17: 270–275.

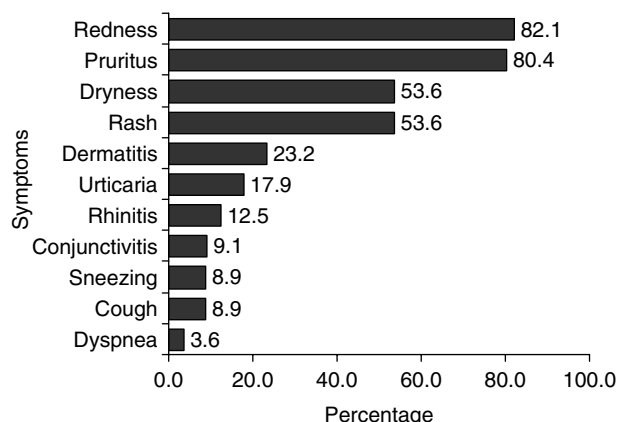


Fig. 1. Allergy to latex gloves-related symptoms.

3. Kaczmarek R G, Silverman B G, Gross T P, Hamilton R G, Kessler E, Arrowsmith-Lowe J T, Moore R M Jr. Prevalence of latex specific IgE antibodies in hospital personnel. *Ann Allergy Asthma Immunol* 1996; 76: 51–56.
4. Brehler R, Kolling R, Webb M, Wastell C. Glove powder – a risk factor for the development of latex allergy. *Eur J Surg Suppl* 1997; 579: 23–25.
5. Liss G M, Sussman G L, Deal K et al. Latex allergy: epidemiological study of 1351 hospital workers. *Occup Environ Med* 1997; 54: 335–342.
6. Grzybowski M, Ownby D R, Peyser P A, Johnson C C, Schork M A. The prevalence of anti-latex IgE antibodies among registered nurses. *J Allergy Clin Immunol* 1996; 98: 535–544.
7. Douglas R, Morton J, Czarny D, O'Hehir R E. Prevalence of IgE-mediated allergy to latex in hospital nursing staff. *Aust N Z J Med* 1997; 27: 165–169.
8. Watts D N, Jacobs R R, Forrester B, Bartolucci A. An evaluation of prevalence of latex sensitivity among atopic and non-atopic intensive care workers. *Am J Ind Med* 1998; 34: 359–363.
9. Brown R H, Schauble J F, Hamilton R G. Prevalence of latex allergy among anesthesiologists: identification of sensitized but asymptomatic individuals. *Anesthesiology* 1998; 89: 292–299.
10. Gautrin O, Ghezze H, Infante-Rivard C, Malo J. Natural history of sensitization, symptoms and occupational diseases in apprentices exposed to laboratory animals. *Eur Respir J* 2001; 17: 904–908.
11. Lagier F, Vervloet D, Lhermet I, Poyen D, Charpin D. Prevalence of latex allergy in operating room nurses. *J Allergy Clin Immunol* 1992; 90: 319–322.
12. Garbarant D H, Roth H D, Parsad R, Yeng G S, Weiss J. Latex sensitization in health care workers and in the US general population. *Am J Epidemiol* 2001; 153: 515–522.
13. Baur X, Chen Z, Allmers H. Can a threshold value for natural rubber latex airborne allergens be defined? *J Allergy Clin Immunol* 1998; 101: 24–27.
14. Kibby T, Akl M. Prevalence of latex sensitization in hospital employee population. *Ann Allergy Asthma Immunol* 1997; 78: 41–44.
15. Smedley J, Bendall H, Coggon D. Prevalence and risk factors for latex allergy: a cross sectional study in a United Kingdom hospital. *Occup Environ Med* 1999; 56: 833–836.
16. Archambault S, Malo J L, Infante-Rivard C, Ghezze H, Gautrin D. Incidence of sensitization, symptoms and probable occupational rhinoconjunctivitis and asthma in apprentices starting exposure to latex. *J Allergy Clin Immunol* 2001; 107: 921–923.
17. Sussman G L. Incidence of latex sensitization among latex gloves users. *J Allergy Clin Immunol* 1998; 101: 171–178.
18. European Commission. Opinion on natural rubber latex allergy. Doc. SANCO/SCMPMD/2000/0009 Final. European Commission – Scientific Health Opinions. The Scientific Committee on Medicinal Products and Medical Devices. Brussels, Belgium 2000.
19. Mikkola J H, Alenius H, Kalkkinen N, Turjanmaa K, Palosuo T, Reunala T. Hevein-like protein domains as a possible cause for allergen cross-reactivity between latex and banana. *J Allergy Clin Immunol* 1998; 102: 1005–1012.
20. Blanco C, Diaz-Perales A, Collada C et al. Class I chitinases as potential pan allergens involved in the latex–fruit syndrome. *J Allergy Clin Immunol* 1999; 103: 507–513.
21. Hollander A, Heederik D, Doekes G. Respiratory allergy to rats' exposure response relationships in laboratory animal workers. *Am J Respir Crit Care Med* 1997; 155: 562–567.
22. Cullinan P, Cook A, Gordon S, Nieuwenhuijsen M J, Tee R D, Venables K M, McDonald J C, Taylor A J. Allergen exposure, atopy and smoking as determinants of allergy to rats in a cohort of laboratory employees. *Eur Respir J* 1999; 13: 1139–1143.
23. Allmers H, Schmengler J, John S M. Decreasing incidence of occupational contact urticaria caused by natural rubber latex allergy in German health care workers. *J Allergy Clin Immunol* 2004; 114: 347–351.
24. Turjanmaa K, Reinikka-Railo T, Palouso T. Continued decrease in natural rubber latex allergen levels of medical gloves in nationwide market surveys in Finland and co-occurring decrease in natural rubber latex allergy in a large University hospital [abstract]. *J Allergy Clin Immunol* 2000; 104: 373.
25. Levy D, Allounche S, Chabane M, Ley Nadier F, Burney P. Powder-free latex gloves and latex sensitization. *JAMA* 1999; 281: 988.
26. Tarlo S M, Easty A, Eubanks K, Parsons C R, Min F, Juvet S, Liss G M. Outcomes of natural rubber latex control program in an Ontario teaching hospital. *J Allergy Clin Immunol* 2001; 108: 628–633.
27. Page E H, Esswein E J, Petersen M R, Lewis D M, Bledsoe T A. Natural rubber latex: glove use, sensitization and airborne and latent dust concentrations at a Denver Hospital. *J Occup Environ Med* 2000; 42: 613–620.
28. Roy A, Epstein J, Onno E. Latex allergy in dentistry: recognition and recommendations. *J Can Dent Assoc* 1997; 63: 297–300.
29. Sinha A, Harrison P V. Latex glove allergy among hospital employees. a study in the north-west of England. *Occup Med (Lond)* 1998; 48: 405–410.
30. Di Lorenzo G, Vitale F, Pacor M L et al. Prevalence of latex sensitization in health care workers of a general hospital in Palermo, Sicily. *J Investig Allergol Clin Immunol* 2002; 12: 114–119.
31. Leung R, Ho A, Chan J, Choy D, Lai C K. Prevalence of latex allergy in hospital staff in Hong Kong. *Clin Exp Allergy* 1997; 27: 167–174.
32. Allmers H, Brehler R, Chen Z, Raulf-Heimsoth M, Fels H, Baur X. Reduction of latex aeroallergens and latex specific IgE antibodies in sensitized workers after removal of powdered natural rubber latex gloves in a hospital. *J Allergy Clin Immunol* 1998; 5: 841–846.

Address:

Dr Zouhair Amarin

PO Box 1572

Amman 11953

Jordan

Tel.: +962 79 522 5155

Fax: +962 6 592 0755

e-mail: zoamarin@hotmail.com