

Prevalence of Allergy to Latex Gloves Among Dental Professionals in Udaipur, Rajasthan, India

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Purpose: Nowadays, gloves are worn routinely by most general dental practitioners while treating patients, with latex being the most commonly used glove material worldwide. The aim of the present study was to determine the prevalence of allergy to latex gloves among dental professionals of Udaipur, Rajasthan, India.

Materials and Methods: In this cross-sectional study, a total of 163 dental professionals (73% males and 27% females) were surveyed using a pre-tested self-administered questionnaire. The questionnaire was comprised of a total of 12 items and gave information about the participants and their glove use, namely demographic profile, working habits and glove use, signs and symptoms related to glove use, any other type of allergy, as well as precautions taken to minimise it. The statistical analysis was performed using chi-square and Fisher's exact tests to compare frequency and percentage. The level of significance was set at $P \leq 0.05$.

Results: A total of 26 (16%) dental professionals reported allergy to latex gloves, of which females (27.3%) reported significantly greater allergy than males (11.8%) ($P = 0.016$). The number of years of glove use was significantly associated with allergy to latex gloves ($P = 0.000$). The prevalence of allergy to latex gloves was significantly greater for those who had allergy to pollen grains, foodstuffs and rubber dam, those who had asthma or history of eczema and those with family history of allergy. However, allergy to latex gloves was independent of age, type of gloves used, hours of use per day as well as number of patients seen per day.

Conclusions: The present study showed a high rate of allergy to latex gloves among dental professionals in Udaipur, Rajasthan, India.

Key words: dental professionals, glove use, allergy to latex gloves

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One of the milestones in medical achievements has been the introduction of surgical gloves made of natural rubber latex (NRL)—commonly thought to have been first used by William Halstead in 1890. Gloves are now worn routinely by most dental practitioners while treating patients, with latex being the most commonly used glove material worldwide. Latex that is used in the manufacture of gloves is derived from the plant *Hevea*

brasiliensis that contains some powerful allergens. Chemicals that are used in manufacturing and sterilising gloves may also act as contact allergens (Amin et al, 1998; Khader et al, 2005). Globally reported rates of allergy to latex gloves among the general population vary from 6% to 12% and those among health care workers vary from 3% to 22% (Turjanmaa, 1987; Garabrant et al, 2001).

Several parameters have been implicated as possible potentiating factors. A strong association was observed between the number of gloves used per day and symptoms of latex sensitisation (Lagier et al, 1992). Investigations verifying the effect of the duration of exposure to NRL gloves have produced conflicting results. Some studies have

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found some positive associations between the duration of latex glove use and incidence of sensitisation (Turjanmaa, 1987; Kaczmarek et al, 1996), but other studies have not found any significant association between the duration of exposure and latex hypersensitivity (Douglas et al, 1997; Kibby and Akl, 1997; Brown et al, 1998). Furthermore, frequent exposures to latex products are significantly correlated with a greater prevalence of allergy to latex gloves among 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 observed (Smedley et al, 1999). A positive association between allergy to latex gloves and allergy to various food substances such as avocados, bananas, kiwi fruit, potatoes, tomatoes and chestnuts has been reported in many studies (Mikkola et al, 1998). Atopy has been found to be a strong effect modifier that potentiates the exposure-response curve (Hollander et al, 1997). Another area of contention has been the allergenic effect of powdered versus non-powdered latex gloves. On one hand, studies have concluded that a reduced use of powdered NRL gloves was associated with a decrease in cases of occupational contact urticaria (Turjanmaa et al, 2000; Allmers et al, 2004), while on the other an isolated study has reported that the prevalence of sensitisation was greater among users of powder-free latex gloves than those using powdered latex gloves (Roy et al, 1997).

As health care professionals, dental workers form an excellent group to evaluate the questions of latex glove-related symptoms. Therefore, the present study was carried out to determine the prevalence of allergy to latex gloves among dental professionals of Udaipur, Rajasthan, India.

MATERIALS AND METHODS

Study area

The present study was carried out for a period of 2 months, from December 2008 to January 2009, in Udaipur, Rajasthan, India, to determine the prevalence of allergy to latex gloves among dental practitioners.

Study population and sampling procedure

A cross-sectional survey was conducted among all of the dental practitioners available at the time of the

study using a standardised questionnaire. All of the dental professionals were visited at a suitable time by a single investigator and were interviewed individually. The questionnaire was pilot-tested in a sample of 40 subjects to ensure an acceptable level of validity and degree of repeatability (Cronbach's $\alpha = 0.76$).

Inclusion criteria

1. Subjects who were registered in the Indian Dental Association, Udaipur branch.
2. Subjects who gave written informed consent.

Exclusion criteria

1. Subjects who were not available at the time of the study.

Ethical clearance

Before commencement of the present study, ethical clearance was obtained from the Ethical Committee of Pacific Dental College and Hospital, Udaipur, Rajasthan, and written informed consent was obtained from all of the dental practitioners who participated in the present study.

Questionnaire

The questionnaire was mainly comprised of 12 items and divided into four sections, namely demographic profile (gender, age, years of latex glove use, hours of glove use per day and number of patients treated per day), working habits and glove use (wearing of gloves while treating a patient, washing of hands before using gloves, changing of gloves after treating each patient, washing of hands after treating each patient and type of gloves used), signs and symptoms related to glove use (incidence of allergic reaction to latex gloves in the work environment, nature of symptoms such as rash, dryness, sneezing, puffiness of eyes or mouth, chest tightness, wheezing, dyspnoea, pruritus and anaphylaxis, and length of time since the onset of allergic reaction), any other type of allergy (any food or drug allergy, allergy to pollen grains, history of contact dermatitis, asthma and eczema, allergy to rubber dams, amalgam or eugenol, family history of allergy) and any precaution taken to minimise symptoms related to latex glove use.

Table 1 The prevalence of allergy to latex gloves by demographic variables

Variables	Allergic to latex gloves n (%)	Non-allergic to latex gloves n (%)	P value
Gender			
Male	14 (11.8)	105 (88.2)	0.016*
Female	12 (27.3)	32 (72.7)	
Age			
< 30 years	17 (16)	89 (84)	0.967
≥ 30 years	9 (15.8)	48 (84.2)	
Years of glove use			
< 4	9 (8.5)	97 (91.5)	0.000*
≥ 4	17 (29.8)	40 (70.2)	
Hours of use per day			
< 5 h/day	21 (15.8)	112 (84.2)	0.906
≥ 5 h/day	5 (16.7)	25 (83.3)	
Number of patients seen per day			
0–5 patients/day	12 (20.3)	47 (79.7)	0.366
6–10 patients/day	6 (10.7)	50 (89.3)	
> 10 patients/day	8 (16.7)	40 (83.3)	

*Significant at $P \leq 0.05$ using chi-square test.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS version 10, SPSS Inc, Chicago, IL, USA) and Microsoft Office Excel 2003 were used for data processing and analysis. Variables were described using frequency and percentage distribution. Chi-square and Fisher's exact tests (when frequency in any cell was < 5) were performed to assess the association between categorical independent variables and latex glove allergy. The level of significance was set at $P \leq 0.05$.

RESULTS

A total of 163 dental professionals (73% males and 27% females) were surveyed. Their age ranged between 24 and 68 years, of which 106 were aged below 30 years and 57 of them were aged 30 years or above. Years of glove use ranged from 0.25 to 35 years.

A total of 26 (16%) dental professionals reported allergy to latex gloves. With regard to gender, females (27.3%) reported significantly greater allergy to latex gloves than males (11.8%) ($P = 0.016$). With regard to age, 16% of the respondents aged below 30 years and 15.8% aged 30 years or above were allergic to latex gloves ($P = 0.967$). With regard to hours of

glove use per day, it was found that there was no statistically significant difference in the prevalence of allergy to latex gloves either among dental professionals who used gloves for 5 or more h/day (16.7%) or among those who used gloves for < 5 h/day (15.8%) ($P = 0.906$). With regard to years of glove use, it was found that respondents who wore gloves for 4 or more years (29.8%) had significantly greater allergy to latex gloves than those who wore gloves for < 4 years (8.5%) ($P = 0.000$). With regard to number of patients seen per day, it was found that 20.3% of the dental professionals who treated five or fewer patients per day, 10.7% of them who treated 6 to 10 patients per day and 16.7% who treated more than 10 patients per day were allergic to latex gloves ($P = 0.366$) (Table 1).

It was found that 17.4% of subjects who did not wash their hands before using gloves as well as 45% of subjects who did not wash their hands after using gloves reported allergy. With regard to type of glove use, it was found that 16.1% participants who wore powdered gloves and 20.7% of those who wore powder-free gloves were allergic to latex gloves (Table 2).

Among latex glove-related symptoms, the most common symptoms were rash (50.2%) and pruritus (19.2%) (Fig 1).

In the present study, most of the participants were having more than two types of allergy. From

Variables	Allergic to latex gloves n (%)	Non-allergic to latex gloves n (%)	P value
Do you wash your hands before using gloves?			0.766**
Yes	22 (15.7)	118 (84.3)	
No	4 (17.4)	19 (82.6)	
Do you change your gloves after treating each patient?			1.00**
Yes	26 (16)	136 (84)	
No	0 (0)	1 (100)	
Type of glove use			0.303**
Powdered	20 (16.1)	104 (83.9)	
Powder-free	6 (20.7)	23 (79.3)	
Both	0 (0)	10 (100)	
Do you wash your hands after using gloves?			0.001*
Yes	17 (11.9)	126 (88.1)	
No	9 (45)	11 (55)	

*Significant at $P \leq 0.05$ using chi-square test. **Not significant at $P > 0.05$ using Fisher's exact test.

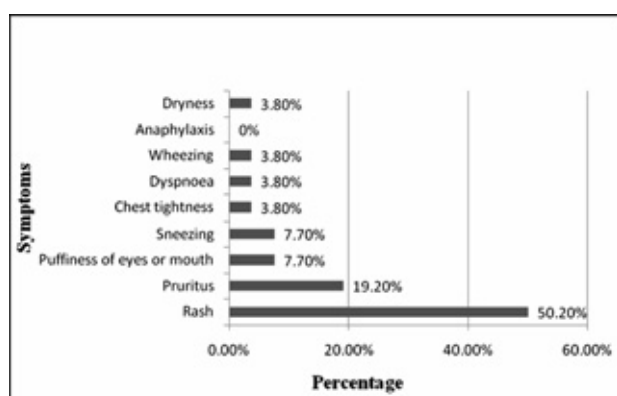


Fig 1 Allergy to latex gloves-related symptoms.

among dental professionals who were allergic to latex gloves, 66.7% had a history of allergy to pollen grains, 64.7% had a family history of allergy and 60% had history of a food or drug allergy ($P = 0.000$). Increased prevalence of allergy to latex gloves was significantly associated with history of contact dermatitis ($P = 0.003$), asthma ($P = 0.037$), eczema ($P = 0.003$), and allergy to rubber dam, amalgam or eugenol ($P = 0.003$) (Table 3).

In the present study, in 56% of dental professionals who had a personal history of atopy, allergy worsened due to the use of latex gloves. From among those who were allergic to latex gloves, 52.3% developed allergy after first exposure, 32.1% within the first year, 10% within the second year and 6.6% within the third year of exposure.

Various allergies	Total	Allergy to latex gloves (%)	P value
History of food or drug allergy			
Yes	15	9 (60)	0.000*
No	148	17 (11.5)	
History of contact dermatitis			
Yes	8	5 (62.5)	0.003*
No	155	21 (13.5)	
History of asthma			
Yes	22	7 (31.8)	0.037*
No	141	19 (13.5)	
History of allergy to pollen grains			
Yes	18	12 (66.7)	0.000*
No	145	14 (9.7)	
History of eczema			
Yes	8	5 (62.5)	0.003*
No	155	21 (13.5)	
Allergy to rubber dam, amalgam or eugenol			
Yes	8	5 (62.5)	0.003*
No	155	21 (13.5)	
Family history of allergy			
Yes	17	11 (64.7)	0.000*
No	146	15 (10.3)	

*Significant at $P < 0.05$ using chi-square test.

With regard to precautions taken by affected individuals to minimise latex glove-related symptoms, it was found that 27% of them did not take any precaution, 17.7% used powder-free gloves and

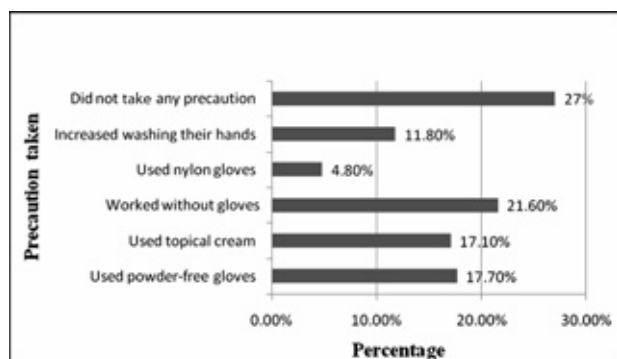


Fig 2 The precautions taken by affected individuals to minimise symptoms.

11.8% increased washing their hands after work to remove any remnants of powder or glove particles, whereas 4.8%, 21.6% and 17.1% worked with nylon gloves, without gloves and using topical cream, respectively (Fig 2).

DISCUSSION

The present cross-sectional study evaluated the prevalence of allergy to latex gloves, glove-related symptoms and factors contributing to this type of allergy among dental professionals in Udaipur, Rajasthan, India. Altogether, 16% of the subjects reported allergy to latex gloves, which is consistent with those of other studies (Kaczmarek et al, 1996; Katelaris and Widmer, 1996; Liss et al, 1997; Watts et al, 1998). Females had significantly greater allergy to latex gloves than males ($P = 0.016$) (Table 1), which is in contrast to the data of another study carried out by Khader et al (2005) who reported no significant difference between gender. In the present study, it was found that there was an increase in the prevalence of allergy to latex gloves with increase in years of glove use ($P = 0.000$) (Table 1), which is in agreement with the findings of earlier studies (Kaczmarek et al, 1996 and Garabrant et al, 2001).

Latex glove-related symptoms were significantly related to positive personal history of atopy. In the present study, the onset of allergic reaction to latex gloves was greatest directly after first exposure. However, allergic reaction to latex gloves starting after first exposure should fully or partly be regarded as irritant reaction. Individuals with immediate allergic reactions after first exposure would not have had the time to develop sensitisation. Mikkola

et al (1998) demonstrated that the highest incidence of sensitisation was noticed in the first 12 months of exposure. Gautrin et al (2001) demonstrated that the incidence of occupation-related sensitisation 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 generalised symptoms, such as asthma, chest tightness and anaphylaxis, which were related to IgE-mediated reactions. This substantiates previously reported rates (Leung et al, 1997; Allmers et al, 1998). There was a strong association between allergy to pollen grains ($P = 0.000$) (Table 3) and allergy to latex gloves. This type of allergy is significantly related to a positive history of common allergic symptoms and to a positive personal history of atopy, which is in agreement with the findings of other studies (Hollander et al, 1997; Blanco et al, 1999; Garabrant et al, 2001) and may be a useful finding as it would be possible to perform precautionary allergy testing on those with a personal history of allergy. Although a high rate of allergic reactions to latex gloves was reported among dental professionals, relying on questionnaire data alone to determine the prevalence of allergy to latex gloves has obvious shortcomings. Confirmation of this prevalence rate requires an objective measure of IgE-mediated hypersensitivity, such as skin testing with appropriate extracts, or an *in vitro* assay of specific IgE antibodies to the latex allergens.

In agreement with the results of a study carried out by Khader et al (2005), the results of the present study also showed no significant difference between allergy to latex gloves and use of powdered or powder-free gloves. However, the performance of hand hygiene procedures after using gloves was significantly associated with allergy to latex gloves ($P = 0.000$) (Table 2), which showed that washing of hands frequently after the use of gloves may help to remove the irritants causing allergy to latex gloves.

The recommended procedure is, therefore, to adopt the use of powder-free gloves to minimise the incidence of allergy to latex gloves in general and to reduce the likelihood of severe allergic reactions in sensitised patients in particular. Also, following proper hand care in the form of frequent washing of hands after using gloves will minimise the chances of irritant dermatitis. Patients with NRL protein hypersensitivity should only use non-latex (nitrile) gloves and seek proper hand care in the form of topical moisturisers and corticosteroid- or antihistamine-containing ointments (Scott et al, 2003).

REFERENCES

1. 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.
2. Allmers H, Schmengler J, John SM. 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.
3. Amin A, Palenik CJ, Cheung SW, Burke FJT. Latex exposure and allergy: a survey of general dental practitioners and dental students. *Int Dent J* 1998;48:77–83.
4. Blanco C, Diaz-Perales A, Collada C, Sanchez-Monge R, Aragoncillo C, Castillo R. Class I chitinases as potential pan allergens involved in the latex-fruit syndrome. *J Allergy Clin Immunol* 1999;103:507–513.
5. Brown RH, Schauble JF, Hamilton RG. Prevalence of latex allergy among anesthesiologists: identification of sensitized but asymptomatic individuals. *Anesthesiology* 1998;89:292–299.
6. Douglas R, Morton J, Czarny D, O'Hehir RE. Prevalence of IgE-mediated allergy to latex in hospital nursing staff. *Aust N Z J Med* 1997;27:165–169.
7. Garabrant DH, Roth HD, Parsad R, Ying GS, Weiss J. Latex sensitization in health care workers and in the US General population. *Am J Epidemiol* 2001;153:515–522.
8. Gautrin O, Ghezzi 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.
9. 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.
10. Kaczmarek RG, Silverman BG, Gross TP, Hamilton RG, Kessler E, Arrowsmith-Lowe JT. Prevalence of latex-specific IgE antibodies in hospital personnel. *Ann Allergy Asthma Immunol* 1996;76:51–56.
11. Katelaris CH, Widmer RP, Lazarus RM. Prevalence of latex allergy in dental school. *Med J Aust* 1996;164:711–714.
12. Khader Y, Abu-Zaghlani M, Abu-Al Rish I, Burgan S, Amarin Z. Self-reported allergy to latex among health care workers in Jordan. *Contact Dermatitis* 2005;53:339–343.
13. Kibby T, Akl M. Prevalence of latex sensitization in hospital employee population. *Ann Allergy Asthma Immunol* 1997;78:41–44.
14. 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.
15. Leung R, Ho A, Chan J, Choy D, Lai CK. Prevalence of latex allergy in hospital staff in Hong Kong. *Clin Exp Allergy* 1997;27:167–174.
16. Liss GM, Sussman GL, Deal K, Brown S, Cividino M, Siu S. Latex allergy: epidemiological study of 1351 hospital workers. *Occup Environ Med* 1997;54:335–342.
17. Mikkola JH, 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.
18. Roy A, Epstein J, Onno E. Latex allergy in dentistry: recognition and recommendations. *J Can Dent Assoc* 1997;63:297–300.
19. Scott A, Gawkrödger DJ, Yeoman C, Egner W, van Noort R, Hatton PV. Adverse reactions to protective gloves used in the dental profession: experience of the UK Adverse Reaction Reporting Project. *Br Dent J* 2003;195:686–690.
20. 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.
21. Turjanmaa K. Incidence of immediate allergy to latex gloves in hospital personnel. *Contact Dermatitis* 1987;17:270–275.
22. 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. *J Allergy Clin Immunol* 2000;104:373.
23. Watts DN, Jacobs RR, 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.

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