ORIGINAL ARTICLE

Prevalence of Latex Hypersensitivity Among Health Care Workers in Malaysia

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Summary

Health care workers have been reported to constitute one of the few high-risk groups related to IgE- mediated hypersensitivity associated with the use of latex products. This paper describes the first ever study of prevalence carried out in Malaysia among these workers. One hundred and thirty health care personnel from Hospital Kuala Lumpur were skin tested. Extracts used were prepared from seven different brands of natural rubber latex gloves with varying levels of extractable protein (EP_{RRIM}). Out of the 130 volunteers, 4 (3.1%) had positive skin test to latex with extracts with high levels of EP_{RRIM} (> 0.7 mg/g). The prevalence among the Malaysian health care workers can be considered to be low in comparison to that of some consumer countries as the USA which reported a prevalence of as high as 16.9%.

Key Words: Latex hypersensitivity, Health care workers.

Introduction

Immediate hypersensitivity reaction to latex was first reported in Germany in 1927[1]. The next report appeared in 1979 when Nutter[2] described a case of contact urticaria due to the use of household gloves. Since then, there has been considerable increase in the number of reported cases of immediate type hypersensitivity to latex products. The clinical manifestations of the allergic reaction concerned are similar to symptoms experienced by anyone who is allergic to food, drug, animal dander or pollen. These include urticaria, asthma, rhinitis, conjunctivitis and even anaphylactic reactions. The allergic reaction is mediated by IgE. Latex antigens bind and cross-link the IgE antibodies on surface of mast cells, leading to mast cell degranulation and subsequent release of various mediators [3]. The release of these mediators cause increased vascular permeability, vasodilation and bronchoconstriction, all being expressed as clinical manifestations of the allergy. Cause of the allergic reaction is attributed to some residual water soluble proteins found in the latex products.

This latex protein allergy occurs in well-defined risk groups which include the health care workers, rubber industry workers and patients with spina bifida. The only common feature among these groups appears to be a high degree of exposure to latex gloves which are extensively used worldwide for their superior physical properties and excellent barrier performance against viruses such as HIV. Healthcare and rubber industry workers are exposed during the course of their occupations, and spina bifida patients through repeated surgery[4].

A number of studies have been published on prevalence of this allergy among the high risk groups, particularly health care workers, in consumer countries in the West.

However, there has been no report on the prevalence of healthcare workers in manufacturing countries in the East. The present paper therefore describes such a study conducted in Malaysia, the world's largest latex product manufacturer.

Materials and Methods

One hundred and thirty health care personnel from Hospital Kuala Lumpur participated in this study. The subjects included 89 nursing staff, 34 housekeeping personnel, 7 dentists and physicians. All the volunteers use latex gloves in their daily work. Number of years of hospital employment ranged from 6 months to 11 years (mean 3.4 years). The mean age of the volunteers was 38 years. One hundred and nineteen (91.5%) were females and 11 (8.5%) were males. They were of various ethnic groups, 82 (63.1%) were Malays, 25 (19.2%) Indians, 19 (14.5%) Chinese and 4 (3.1%) others. All the volunteers had not taken any anti-histamines for at least one week prior to testing. The research protocol was reviewed and approved by the Ministry of Health Ethics Committee. An informed consent was obtained from all the participants. Each participant was interviewed and a questionnaire was completed. The following items were asked: occupational history, amount and duration of glove use, symptoms associated with glove use, history of allergy and history of worm infestation.

Glove Extracts

Extracts of 7 different brands of gloves were prepared. One gram of each brand of glove was cut into 1 cm^2 pieces. The glove pieces were soaked in 5 mls of phosphate-buffered saline (PBS) pH 7.4 for 1 hour at room temperature. The extracts were used as allergens in the skin prick test (SPT). Extracts were prepared on the same day as testing. The extractable protein content of the gloves was determined by the RRIM modified Lowry microassay [5].

Skin Prick Test

SPT was carried out on the volar aspect of the forearm. Histamine 1 mg/ml (Bencard, UK) and PBS was used as a positive and negative control respectively. A drop of each extract and controls were placed on the skin. A sterile lancet (Microlance, Becton Dickinson) was used to lift the skin through the drop of allergen. After 15 minutes, the size of the wheals was measured. The reactions were graded as follows: (-) no wheal and no erythema, (+) wheal absent but there is slight erythema, (2+) when the wheal is not more than 2 mm in diameter, (3+) for a wheal between 3 to 5 mm and (4+) for any larger reaction. A grade of 2+ or more was considered positive.

Total IgE

Total IgE was measured using the kit Enzygnost - IgE micro (Behring) following the manufacturers instructions.

Statistical Analysis

The statistical package SPSS was used for data entry and statistical analysis. A chi-square test was used to determine the significance of variables.

Results

A total of 130 health care employees participated in the study. They comprise various occupational sub-groups, namely, nurses, housekeeping staff, dentists and physicians. Diagnosis of allergy was carried out by the skin prick test (SPT) using extracts from seven different brands of latex gloves with extractable protein content, (EP_{RRIM}), ranging from 1.01 mg/g to 0.02 mg/g. as determined by the RRIM modified Lowry Test.

Four employees reacted positively when tested against extracts from gloves with high EP content of >0.7 mg/g (Table I). No positive SPT reaction was however detected when tested against extracts from gloves with EP_{RRIM} contents of about 0.1mg/g and lower, with the exception of one who showed a weak response. Distribution of the four SPT positive subjects among the occupational sub-groups can be seen in Table II.

All four SPT positive subjects were females. Their mean duration of glove-use was 4.5 hours per day as compared to the 3.3 hours per day for the SPT negative group. This difference is however, not statistically significant. There was no difference in the number of pairs of gloves used per day between the two groups. SPT positivity was also not associated with any particular ethnic group.

Table I
Extractable protein content of the gloves and SPT results for the positive cases

Protein content (mg/g)	Case #1	Case #2	Case #3	Case #4
1.01	4+	2+	2+	2+
0.75	4+	2+	2+	2+
0.69	NR	2+	NR	NR
0.64	3+	2+	2+	2+
0.11	NR	2+	NR	NR
0.07	NR	2+	NR	NR
0.02	NR	2+	NR	NR

NR = no reaction

Table II
Prevalence of latex hypersensitivity amongst the various professional groups

	No. of subjects	SPT positive to latex
Nursing	89	1
Housekeeping	34	2
Dentists & Physicians	7	1
Total	**130**	**4 (3.1%)**

Among the SPT positive subjects, three reported symptoms associated with latex glove-use (Table III). Pruritis of the hands and allergic rhinitis were common complaints. One subject had contact urticaria associated with glove-use while two experienced more than one symptom related to glove-use.

Among the latex sensitised subjects, 3 had history of atopy. Two out of the four latex skin test positive individuals gave a history of asthma compared with 8 out of the 126 latex skin-test negative individuals. Hence, a history of asthma was statistically associated with SPT positivity to latex ($p = 0.028$). A history of allergic rhinitis, atopic eczema, urticaria, drug allergy and food allergy, did not appear to be associated with the SPT positive reaction observed. The total IgE levels were raised in 3 of the 4 subjects (mean 127.5 IU/ml). The normal level for IgE being less than 100 IU/ml. However, when compared to those shown by the SPT negative subjects, the difference was only minimal. No worm infestation was recorded which could account for the slightly higher levels observed.

Discussion

For the present prevalence study, the most sensitive and preferred method of skin-prick test has been used for diagnosis of Type I allergy. Application of other diagnostic methods, e.g. the radio-allergosorbent test (RAST) is also possible, but such test has a sensitivity range of only 50-80%[6,7], and it lacks sufficient predictive value. It is noteworthy that inspite of being recognised as the best test, a standardised latex allergen mixture which is essential for the skin prick test is still lacking. In view of this, many investigators often prepare their mixture from latex itself or from extract of a latex

product, although a few such reagents are also commercially available. Extracts used in this study were prepared from seven brands of latex gloves with EP content varying from the maximum to the minimum levels often encountered in this product. While those from high EP content gloves were expected to contain most, if not all, of the relevant allergens needed for the test, the use of extracts from low EP gloves could indicate if these allergens were still present in gloves with such low EP contents. Our findings showed quite clearly when tested with extracts from gloves with high EP content of >0.7mg/g, 4 out of 130 subjects were SPT positive, giving a prevalence of 3.1%. The number decreased markedly to only one when the EP content was reduced to about 0.1 mg/g and less. Such diminished SPT responses indicated that the allergen activity in these gloves were much reduced, hence confirming their near non-allergenicity at these EP levels [8].

We found the prevalence of latex hypersensitivity to be 3.1% which is comparable to that found among health care workers in Finland [9] (2.8%), France 10 (2.6%) and Sweden 11 (3.5%). In USA and Canada higher prevalence rates have been reported. Kibby et al screened 135 hospital workers in the USA and found a prevalence rate of 8.2% [12]. Yassin et al found a prevalence of 16.9% amongst hospital employees[13]. A larger study involving 1351 health care workers in the Canada gave a prevalence rate of 12.1%[14]. The reported prevalence of latex hypersensitivity varies considerably. One of the reasons could be due to the extracts used for skin testing. In most studies the investigators prepare their own extracts using glove eluates. As there is great variability in the amount of extractable protein among the various brands of latex gloves[15], the extracts used by different investigators vary in allergenicity. To identify sensitised subjects in the population tested, we used extracts prepared from gloves with high as well as low extractable protein content (1.01 - 0.02 mg/g) and included 2 brands of gloves commonly used by the staff of the hospital. Another explanation for the observed variation in prevalence rates could be due to knowledge of latex hypersensitivity amongst the health care personnel, with greater awareness resulting in more latex positive volunteers. In the study carried out by Yassin et al,[13] the authors suggest that the high prevalence of 16.9% could be due to the fact that they might have included a falsely high percentage of latex positive employees as their study was preceded by an extensive latex sensitivity awareness programme. In our study, we could not rule out the possibility of sampling bias in that latex allergic individuals especially those with severe symptoms had moved on to other employment. This could possibly have occurred among the housekeeping personnel.

It has been reported that most latex SPT positive individuals have mild or even unrecognised symptoms[4], [16]. In the present study, two of the four SPT positive subjects tested showed only mild symptoms which included urticaria, pruritis and rhinitis (Table III). A third subject (Case #1) has rhinitis and asthma associated with latex exposure. The fourth subject, (Case #2) did not complain of any symptoms at all. It is interesting to note that this same subject demonstrated mild SPT responses with all the test eluates regardless of their protein concentrations. Dermographism was excluded in this subject as she did not react with the negative control.

Atopy appears to be an added risk factor, as shown by Sussman et al[17] who reported 57% of the latex hypersensitive persons studied had personal history of allergic rhinitis, asthma or food allergy. This is consistent with our present findings that 3 out of the 4 SPT positive subjects are atopic. Respiratory symptoms were present in two of the SPT positive subjects. This is also not uncommon in latex hypersensitivity as latex can be carried as an aeroallergen by cornstarch powder. However, it should be stressed that cornstarch powder, which is often used in the production of latex gloves, is not an allergen. It can nevertheless adsorb some of the undesirable soluble proteins from the gloves, and becomes airborne during handling and usage of gloves. Although repeated and prolonged exposure to latex gloves or products are believed to be a determinant for the development of the allergy, such relationship has not been observed in this study.

Although a prevalence of 3.1% is not high among the Malaysian health care workers, it is felt that for safety measures, it is beneficial for the health care community to be educated on the protein allergy problem.

Table III
Symptoms associated with glove use

	Case #1	Case #2	Case #3	Case #4
Sex/ Ethnic group	F/I	F/C	F/M	F/I
Urticaria	-	-	Y	-
Erythema	-	-	-	-
Pruritis	-	-	Y	Y
Rhinitis	Y	-	Y	-
Asthma	Y	-	-	-

F = Female
I = Indian
M = Malay
C = Chinese

Furthermore, the use of low EP gloves should be encouraged. It may be heartening to know that, manufacturers of natural rubber latex gloves are making great efforts to improve their products. This should result in a lower incidence of latex allergy.

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