

Prevalence of Latex Allergy among Healthcare Workers at King Abdulaziz University, Jeddah, Saudi Arabia: A Cross-sectional Study

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Received: January 08, 2021; Published: January 20, 2021

Abstract

Background: Natural rubber latex is present in medical products, including gloves, bandages and catheters. The rates of latex allergy have increased in recent decades, making it an occupational health hazard among healthcare workers (HCWs). Few studies have described latex allergy in Saudi Arabia.

Objectives: This study aimed to estimate the prevalence of latex allergy among Saudi HCWs.

Design: Cross-sectional study.

Setting: King Abdulaziz University Hospital (KAUH).

Materials and Methods: HCWs from the main KAUH departments were included. A validated questionnaire adapted from the American College of Allergy, Asthma and Immunology guidelines for the management of latex allergy was used to assess symptoms.

Main Outcome Measures: The prevalence of latex allergy symptoms and that of associated allergic diseases.

Sample Size: A total of 216 participants (115 [53.2%] male).

Results: The participants were physicians (122 [56.5%]) and nurses (54 [25%]). A total of 47 (21.8%) participants had a history of rash, itching, cracking, scaling, or weeping of the skin after latex glove use. Itching, sneezing, runny nose, and swelling of the hands were the most common associated symptoms. Commonly reported past allergic diseases included eczema (20.4%), hay fever (12.5%), and a history of frequent surgeries or other invasive medical procedures (14.8%). A history of anaphylaxis or intraoperative shock, or allergic symptoms following a dental, pelvic, or rectal examination, or after using condoms, diaphragms, or latex-based sexual aids were reported by 1.9%, 2.8%, and 2.3% of participants, respectively. There was a significant association between latex allergy symptoms and the type of occupation performed as well as the history of anaphylaxis and exposure to latex-based products. Allergic symptoms following consumption or handling of banana, pineapple, or kiwi were reported by 1.4% of subjects.

Conclusion: Latex allergy symptoms are common among HCWs in KAUH; however, few HCWs have reported significant anaphylactic reactions. These findings suggest that the use of powder-free latex gloves in lieu of latex gloves by HCWs can help reduce the prevalence of adverse reactions to latex. Clinical evaluation and guidance should be provided to HCWs with present or past latex-associated allergic reactions.

Keywords: Diabetes Mellitus; Chronic Complications; Risks; Management

Introduction

Natural rubber latex (NRL) is widely used in the medical field. Due to its elasticity, durability, and strength, NRL is present in medical products such as gloves, catheters, bandages, various types of dressing and syringes [1]. NRL is manufactured from the sap of the *Hevea brasiliensis* tree, also known as the rubber tree. It contains many cellular proteins, lipids and amino acids that can act as allergens, stimulating an exaggerated immune response [2].

Fifteen allergenic proteins (Hevb1 to Hevb15) have been identified as the drivers of NRL allergies. These proteins can elicit IgE-mediated hypersensitivity reactions, ranging from mild contact dermatitis, urticaria, rhino-conjunctivitis, and asthma to severe anaphylactic shock [3,4]. NRL allergy was first reported in 1927 in Germany, presenting with symptoms of urticaria and laryngeal edema. Since then, the prevalence of NRL allergy has continued to increase among healthcare workers (HCWs) and among the general population [5].

Physicians, nurses, dentists, and lab workers report high rates of NRL allergies due to the frequent use of NRL products, such as gloves. With the introduction of NRL-free gloves and powder-free low-protein gloves, the prevalence of NRL allergy began to decrease. However, it remains high in countries where the use of NRL alternatives is rare [6]. Currently, the worldwide prevalence of NRL allergy among HCWs is estimated at 9.7% [6]. In addition, studies have revealed that patients are susceptible to NRL allergy: in particular, those who undergo surgical procedures and use NRL-based medical products such as catheters [7]. Finally, evidence suggests that patients with spina bifida and myelomeningocele are most susceptible to NRL allergy [6].

Previous studies have reported on the prevalence of NRL allergy in Saudi Arabia. For example, Sabry estimated it at 13.93%, with rates significantly higher among women than among men [8]. In addition, Rattan., *et al.* reported the prevalence of NRL allergy among Saudi children with spina bifida as 25%, with rates higher among boys than among girls [9]. Nevertheless, previous studies on the prevalence of NRL allergy in Saudi Arabia reported inconsistent findings; moreover, these studies are over 28 years old [10,11] and therefore likely present outdated information.

Aim of the Study

In response, the present study aimed to provide up-to-date estimates of NRL allergy prevalence among HCWs exposed to NRL-containing products employed at the King Abdulaziz University Hospital (KAUH). These findings may improve the understanding of NRL allergy patterns and associated risk factors in this professional group.

Materials and Methods

This cross-sectional study was conducted at the KAUH. Physicians, nurses, and lab technicians from the main hospital departments were eligible to participate. Staff from other hospitals were not eligible for this study. The power analysis was conducted according to information gleaned from a prior study and 216 employees were selected by random sampling and enrolled.

Data collection

A validated questionnaire adapted from the American College of Allergy, Asthma, and Immunology [10] guidelines for the management of NRL allergy was modified as per our requirements and presented in a paper-based format. The questionnaire consisted of three parts. The first part collected information on sociodemographic characteristics such as age, sex, and job title. The second part collected information on the history of allergy, use of latex gloves, and patterns of allergy. The third part collected information on the experience of symptoms such as urticaria, rhinoconjunctivitis and respiratory problems. Participants who could not complete a paper-based questionnaire were provided with an online version.

Ethical approval

The objectives and procedures of this study were explained to the participants, and informed consent was obtained. The study was approved by the Research Ethics Committee at the unit of Biomedical Ethics at the KAUH (certificate no. SRAU-2017-F-G16-TCC17). All study activities were carried out in conformance with the Declaration of Helsinki.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (version 13.0; IBM, Armonk, NY). Categorical variables were reported using frequencies and percentages, and continuous variables were reported using means and standard deviations.

Leven’s test was used to verify the assumption of homogeneity of variance in the study sample. The t-test was used for between-group comparisons of the means. *P*-values < 0.05 were considered indicative of a statistically significant finding, and a confidence interval of 95%.

Results

A total of 216 participants were included in this study (115 [53.2%] men). Participants ranged in age from 21 to 62 years. The majority were between 21-31 years of age (50.92%) and consisted primarily of physicians (122 [56.5%]) and nurses (54 [25%]). The data were collected at 18 departments, with the highest contribution from the surgical department (10.6%), followed by obstetrics and gynecology (9.3%), pediatrics (8.3%), internal medicine (7.9%) and outpatient clinics (0.5%) (Table 1).

Variables	Frequency (%)
Sex	
Female	101 (46.8)
Male	115 (53.3)
Age (years)	
21 - 31	110 (5.92)
32 - 41	71 (32.87)
42 - 51	24 (11.11)
52 - 61	10 (4.62)
> 62	1 (4.6)
Occupation	
Physician	122 (56.5)
Nurse	54 (25.0)
Technician	33 (15.3)
Others	7 (3.2)
Department	
Surgery	23 (10.6)
Obstetrics and gynecology	20 (9.3)
Pediatrics	18 (8.3)
Internal medicine	17 (7.9)
Otolaryngology	14 (6.5)
Anesthesia	13 (6)
Lab workers	13 (6)
Blood bank	13 (6)
Family medicine	12 (5.6)
Orthopedic	12 (5.6)
Ophthalmology	12 (5.6)
Radiology	12 (5.6)
Emergency medicine	12 (5.6)
Urology	12 (5.6)
Dermatology	7 (3.2)
Patient education	3 (1.4)
Hematology	2 (0.9)
	1 (0.5)

Table 1: Baseline characteristics of the study subjects.

The pattern and frequency of allergic symptoms and history of allergy among the study participants are presented in table 2. A high proportion of the respondents regularly wore NRL gloves and worked with colleagues who wore such gloves (84.7% and 82.9%, respectively). Commonly reported past allergic diseases included eczema (20.4%), hay fever, and other common allergies (12.5%), as well as having frequently undergone surgeries or other invasive medical procedures (14.8%) or showing symptoms of NRL allergy during infancy (3.7%).

Question	Yes Frequency (%)	No Frequency (%)
Do you wear latex gloves regularly or are you otherwise exposed to latex regularly?	183 (84.7)	33 (15.4)
Do you have a history of eczema or other types of rash on your hands?	44 (20.4)	172 (70.6)
Do you have a history of frequent surgeries or other invasive procedures?	32 (14.8)	184 (85.2)
Did these take place when you were an infant?	8 (3.7)	208 (96.3)
Do you have a history of hay fever or other common allergies?	27 (12.5)	189 (87.5)
Do your colleagues wear latex gloves regularly?	179 (82.9)	37 (17.1)
Do you experience rash, itching, cracking, chapping, scaling, or weeping of the skin from latex glove use?	47 (21.8)	169 (78.2)
Have these symptoms recently changed or worsened?	13 (6.0)	203 (94)
Have you used different brands of latex gloves?	121 (56)	95 (44)
If so, have your symptoms persisted: Have you used non-latex gloves?	63 (29.2)	153 (70.8)
If so, have you had the same or similar symptoms as with latex gloves?	12 (5.6)	204 (94.4)
Do these symptoms persist when you stop wearing all gloves?	40 (18.5)	176 (81.5)
When you wear or are around others wearing latex gloves do you get hives, red itchy swollen hands within 30 minutes or, "water blisters" on your hands within a day?	17 (7.9)	199 (92.1)
When you wear or are around others wearing latex gloves, have you noted any: Itchy, red eyes, fits of sneezing, runny or stuffy nose, itching of the nose or palate?	17 (7.9)	199 (92.1)
Shortness of breath, wheezing, chest tightness or difficulty breathing?	3 (1.4)	213 (98.6)
Other acute reactions, including generalized or severe swelling or shock?	2 (0.9)	214 (99.1)
Do you have a history of anaphylaxis or intra-operative shock?	4 (1.9)	212 (98.1)
Have you had itching, swelling or other symptoms, following dental, rectal, or pelvic exams?	6 (2.8)	210 (97.2)
Have you experienced swelling or difficulty breathing after blowing a balloon?	12 (5.6)	204 (94.4)
Do condoms, diaphragms, or latex sexual aids cause itching or swelling?	5 (2.3)	211 (97.7)
Do rubber handles, rubber bands or elastic bands, or clothing cause any discomfort?	25 (11.6)	191 (88.4)

Table 2: Questions assessing allergy symptoms, latex use, and past history.

Table 3 summarizes the association between the intake or handling of some foods and the appearance of allergic symptoms. A total of 91.2% of participants reported having no symptoms; in contrast, handling or consuming banana, pineapple, or kiwi triggered allergic symptoms in 1.4% of participants.

	Frequency (%)
Nothing	197 (91.2)
Banana	3 (1.4)
Kiwi, pineapple	3 (1.4)
Celery	2 (0.9)
Kiwi	2 (0.9)
Kiwi, pineapple, melon	1 (0.5)
Kiwi, pineapple	1 (0.5)
Pineapple	1 (0.5)
Kiwi, banana, pineapple, melon, chestnut	1 (0.5)
Apple, passionfruit	1 (0.5)
Peach	1 (0.5)
Apple	1 (0.5)
Tomato	1 (0.5)
Chestnut	1 (0.5)

Table 3: Food items that cause hives, itching of the lips or throat, or more severe symptoms when consumed or handled by the survey respondents.

There were significant associations between latex allergy symptoms and exposure to various risk factors (Table 4).

	P-value/df
Occupation	0.000/3
Do you have a history of anaphylaxis or intra-operative shock?	0.009/1
Have you had itching, swelling or other symptoms following dental, rectal or pelvic exams?	0.000/1
Have you experienced swelling or difficulty breathing after blowing up a balloon?	0.000/1
Do condoms, diaphragms or latex sexual aids cause itching or swelling?	0.001/1
Do rubber handles, rubber bands or elastic bands or clothing cause any discomfort?	0.000/1

Table 4: P-value of possible risk factors with latex symptoms.

Discussion

NRL-associated allergies are among the most recent disorders experienced by HCWs. Since the condition was first described in 1927, the prevalence of NRL allergies has been increasing [5]. However, few previous studies have reported on these allergies among the residents of the Middle East; at present, there is a lack of data on their prevalence and associated risk factors or complications.

In the present study, 21.8% of participants reported having a history of allergic symptoms such as itching, scaling, and weeping of the skin after wearing NRL gloves; the corresponding value reported by Turjanmaa [10] in 1987 was 7.4%, suggesting an increase in the prevalence of NRL allergy over time. Previous studies by Lagier, *et al.* [11] and Kujala [12] reported an NRL allergy prevalence of 10% and 12%, respectively. Furthermore, the corresponding estimates reported by Amarasekera, *et al.* [13] were in the range of 3 - 17%. Recently, Wu, *et al.* conducted a systematic review of previous studies, demonstrating that the prevalence of NRL allergy among HCWs, susceptible patients and workers in rubber-related industries was 12.4%, 7.2% and 4.3% respectively [6].

These findings indicate a between-region variability in the severity of these allergies, which is likely mediated by the frequency of use, type of material involved, and the availability of alternatives such as non-NRL gloves. However, findings from most studies suggest that the prevalence of NRL allergy continues to increase. This phenomenon might be related to the increased use of NRL-derived products, such as gloves and catheters, in medical settings. In the present study, 82.9% of HCWs reported wearing NRL gloves as part of their work, increasing their exposure to this allergen. In addition, 56% of the participants reported using different brands of NRL gloves; using gloves made of inferior materials may increase the risk of allergic symptoms.

The symptoms of NRL-associated allergies range from allergic dermatitis to anaphylactic shock [14]. In the present study, symptoms included redness, itching, and localized swelling of the hand (7.9%). Two (0.9%) participants reported generalized swelling and shock and 3 (1.4%) participants reported shortness of breath, chest tightness, and asthmatic attacks. These symptoms may be associated with the history of anaphylaxis, which makes the patient susceptible to the allergen. In the present study, 4 (1.9%) patients reported having a history of anaphylaxis or intraoperative shock. Moreover, symptoms of NRL allergies were associated with exposure to NRL gloves and other products such as condoms, diaphragms, and NRL-based sexual aids. Finally, some participants reported having a history of itching after using rubber or elastic bands. These findings are consistent with prior studies that found the most common symptoms were frequent irritation from latex gloves and allergic dermatitis followed by IgE-mediated hypersensitivity [1].

The association between NRL allergy and exposure to particular types of fruit has been previously reported. Wagner and Breiteneder demonstrated cross-reactivity between NRL allergens called hevein and hevein-like domains and specific proteins identified in fruit such as kiwi, avocado, watermelon, carrot, apple, cherry, and pineapple. These allergens cross-react with the NRL hevein allergen and produce an IgE-mediated hypersensitivity reaction in a process called latex-fruit syndrome [15]. Documented symptoms include mouth itching, nausea, vomiting, angioedema, urticaria, rhinitis and asthma [16].

In the present study, most participants (91.2%) had no history of food allergy. However, three participants reported having had an allergic reaction to banana, kiwi, celery, pineapple, chestnut, apple, tomato, or a combination thereof. These findings are consistent with those of previous studies [15-18]. However, the rate of latex-fruit syndrome in our study was lower than that previously reported. This discrepancy may be accounted for by among-study differences in methodology used to recognize this condition; the present study was questionnaire-based instead of using a skin prick test or specific IgE serum levels to confirm NRL allergy [16,19].

Limitation of the Study

This study has some limitations. The number of participants was not equally distributed across the participating departments, with few participants from dermatology, hematology, and patient education departments. In addition, some employees declined the invitation to participate in this study due to their workload. This led to a non-representative sample, which might have affected the results. Finally, objective methods, such as skin prick tests and serum IgE levels, were not used to confirm NRL allergy. Further studies are needed to explore NRL allergy in HCWs.

Conclusion

In conclusion, the prevalence of NRL allergy among HCWs at KAUH is 22%, and those with NRL allergy presented with mostly benign symptoms. However, a few participants reported severe anaphylactic reactions. Hence, the reduced use of NRL gloves in favor of powder-free NRL gloves among HCWs is recommended to prevent allergic reactions. Moreover, skin prick tests and suitable clinical evaluation and guidance should be provided for symptomatic HCWs with a history of NRL-related allergic symptoms.

Disclosures

There are no conflicts of interest to disclose.

Acknowledgments

We would like to acknowledge Prof Emad A. Koshak for his remarkable notes and contribution to our paper. We would also like to acknowledge statistician Huda for her help and guidance in data analysis. We would like to thank Editage (www.editage.com) for English language editing.

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Volume 17 Issue 2 February 2021

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