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Original Research Article

Latex allergy as risk factor for the sensitization to aero- and tropho-allergens among Albanian dental students

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Abstract: Latex allergy is a common occupational disease among healthcare workers who use latex gloves. The aim of the present study was to determine the prevalence of allergy to latex gloves among dental students and its role on the sensitization to different aero- and tropho-allergens. In this prospective study, a total of 240 students separated as non-exposed, shortly-exposed and longer-exposed during school practice completed a self-administrated questionnaire that comprised of a total of different items and gave information about the participants and their glove use, working habits and glove use, signs and symptoms related to glove use, additional allergic diseases, etc. Challenge and patch tests were performed through latex gloves, skin prick test for latex, aeroallergens and trophoallergens with commercial extracts. Questionnaire items and diagnostic tests revealed that one-fourth of subjects were suspicious for latex gloves hypersensitivity. Contact urticaria, irritant or allergic dermatitis was observed on 10% to 14% of students, while the non-cutaneous symptoms were observed on less than 5% of them. In general, students who experienced latex exposure over 2 years during their school practice have shown about a two-fold positive response for statements or diagnostic tests about latex gloves hypersensitivity. Sensitization to aeroallergens and trophoallergens is shown in 38% and 12% of subjects respectively. Because of relationship between allergic reactions to latex gloves and some medical histories, it seems to be necessary for pre-matriculation evaluation and periodic health surveillance of dental students. Latex allergy also seems to be a risk factor for the sensitization to diverse atopenes.
Keywords: latex allergy, clinical phenotypes, questionnaire, personal atopy, aeroallergens, trophoallergens

INTRODUCTION

Latex allergy is a common occupational disease among healthcare workers who use latex gloves [1-3]. The use of latex gloves by healthcare workers can lead to multiple symptoms like eczema, contact urticaria, rhinitis, conjunctivitis, asthma, and anaphylaxis [4-5]. Diagnosis of latex allergy is based on personal history, physical examination, and diverse diagnostic procedures (skin prick tests, specific IgE, patch test, challenge test), while self-administrated questionnaires are largely used to assess the respective data [6-9]. Despite the widespread use of latex gloves, there is lack of additional data with regards to subjects with latex allergy in the dental care setting in Albania

[10]. Literature's data indicate that latex allergy is often associated to personal or even familiar atopy response [4,11]. The aim of the present study was to determine the relationship between latex gloves allergy among dental students in the Albanian University of Tirana (Albania) and the sensitization to aeroallergens and food allergens.

MATERIAL AND METHOD

In this prospective study, a total of 240 students (42% males and 58% females, mean age 22.8±3.4 years) were first surveyed using a self-administered questionnaire during academic years 2012-2013 and 2013-2014. The questionnaire was comprised of different items and gave information about the participants in regard to working habits, glove use, previous chirurgical interventions, signs and symptoms related to latex gloves usage, any other type of allergy, familiar atopy, as well as precautions taken to minimize the latex allergy, which in general, have been topic of previous studies. Apart from questionnaire (completed by all subjects), prevalence of latex sensitization, as well as sensitization to different aeroallergens and food allergens were determined in a randomized sample of students by commercial skin prick tests (Stallergenes). The respective tested aero- and tropho-allergens are shown in Figure 5 and Figure 6. Additional tests for determination of the latex allergy were patch tests with natural rubber glove (including latex-free glove as control), as well as the challenge test with dermal and airborne exposure to nature rubber latex and latex-free gloves. Similarly to self-administrated questionnaire, the challenge test has been performed by all students.

According to latex gloves exposure during school practice, population was classified in three groups: as non-exposed (n=33), exposed for a few months (shortly exposed, n=136), and exposed for a longer period than two years (longer exposed, n=71). The suspected cases for adverse reactions during latex exposure were further classified as irritant skin reactions (dried skin, localized erythema, adverse reactions to detergents or disinfectants - mentioned on disease history questionnaire items and confirmed during challenge test, but lack of positive or relevant results for the latex allergy tests), allergic skin reactions (diverse allergy skin reactions like erythema, eczema / cracked hands, hives, angioedema, associated with positive results for latex allergy tests), and internal organs allergic reactions (breathlessness attacks, cough, rhinitis and/or conjunctivitis symptoms, arterial hypotension, associated by positive tests for latex allergy). Comparisons were made between the different variables by Fisher's exact test, and Kendall´s tau correlation coefficient helped to investigate the relationship between diverse questionnaire and diagnostic test items. Statistical significance is settled for p value 0.05 or lower.

RESULTS

Ninety-five percent of students were regular users of natural rubber gloves. In total, 25% of subjects (60 cases) were suspected for adverse reactions during natural rubber latex exposure. According to school practice grouping, in the non-exposed group were suspected 6 cases (18.2%), in the shortly-exposed group 26 cases (19.1%), and in longer exposed group were suspected 28 cases (39.4%, $p < 0.002$). With respect to irritant contact reactions, these values were 15.2%, 11.8% and 35.2% respectively ($p < 0.0002$). Regarding allergic reactions on the skin, the respective values were 3%, 11% and 26.8% ($p < 0.002$). With respect to allergic symptoms manifested on internal organs, these values were 3%, 2.9% and 5.6% (ns) (Table 1, and Figures 1-4 respectively). A history for an additional allergic pathology is reported in 42 cases (17.5%), and a familiar history in 63 cases (26.3%). Positive result for respective tests is reported 13 subjects (5.4%) and in particular a food allergy is reported in 37 cases (15.4%). These results showed any difference between studied groups (see Table).

A correlation between the reported latex-nonrelated allergies and latex hypersensitivity is determined among students with latex skin allergy who were longer exposed during dental practice. With respect to reported food allergy, it is determined a consistent correlation even after short latex exposure, especially among students who developed skin allergic symptoms. With respect to previous positive skin tests were determined any correlation to latex hypersensitivity (see also Table 2). Skin prick tests to aeroallergens revealed a mono- or polysensitisation in 19 subjects (38%), without any difference between study groups. The most important allergens were house dust mites, cockroach, cat's epithelia, grasses and ash pollens (see Figure 5). Skin prick tests to trophoallergens revealed a mono- or polysensitisation in 6 subjects (12%), without any difference between study groups. The most important allergens were peanut and wheat (see also Figure 6).

Table 1: Reactions to latex exposure and reports about additional allergies (including the food allergy), and personal and familiar atopy

Type of reaction to latex exposure	Non-exposed (33)	Shortly-exposed (136)	Longer exposed (71)	Total (240)	P
Suspected adverse reactions	6 (18.2%)	26 (19.1%)	28 (39.4%)	60 (25%)	.002
Irritant skin reactions	5 (15.2%)	16 (11.8%)	25 (38.2%)	46 (19.2%)	.0002
Allergic skin reactions	1 (3%)	15 (11%)	19 (26.8%)	35 (14.6%)	.002
Internal organ allergic reactions	1 (3%)	4 (2.9%)	4 (5.6%)	9 (3.8%)	ns
Additional allergic pathologies	42 (17.5)	7 (21.2)	17 (12.5)	18 (25.4)	ns
Familiar history for allergies	63 (26.3)	9 (27.3)	39 (28.7)	15 (21.1)	ns
Previous positive allergy tests	13 (5.4)	1 (3.0)	8 (5.9)	4 (5.6)	ns
Previous food allergies	37 (15.4)	4 (12.1)	24 (17.6)	9 (12.7)	ns

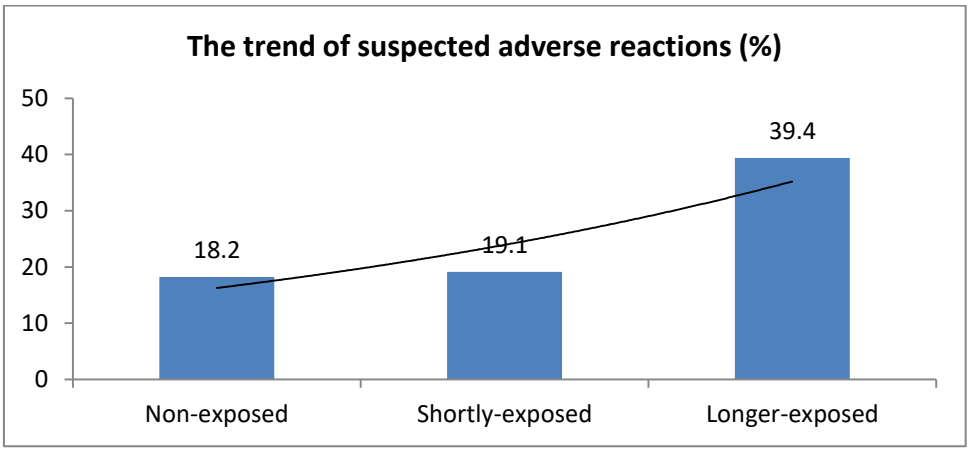

Fig 1: The trend of suspected adverse reactions

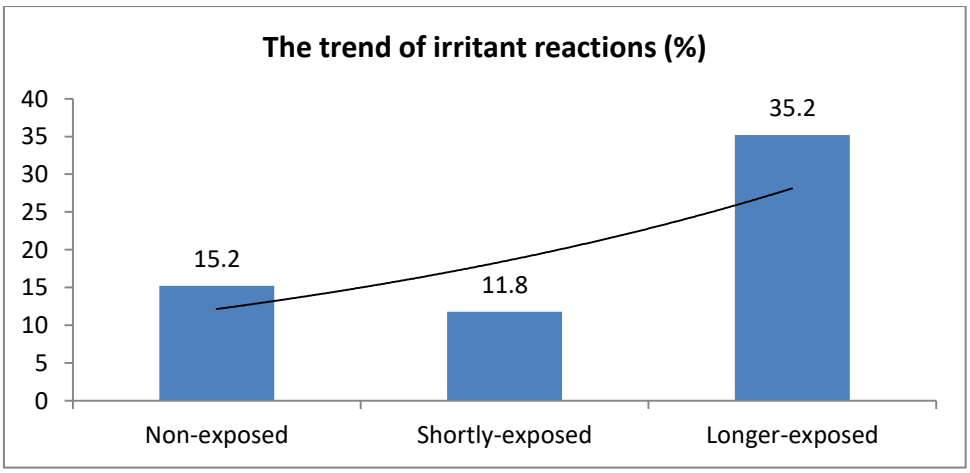

Fig 2: The trend of irritant reactions

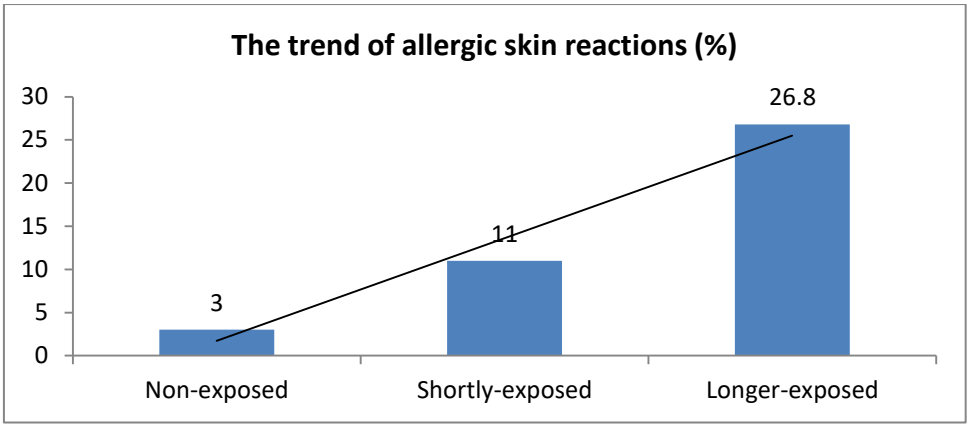

Fig 3: The trend of allergic skin reactions

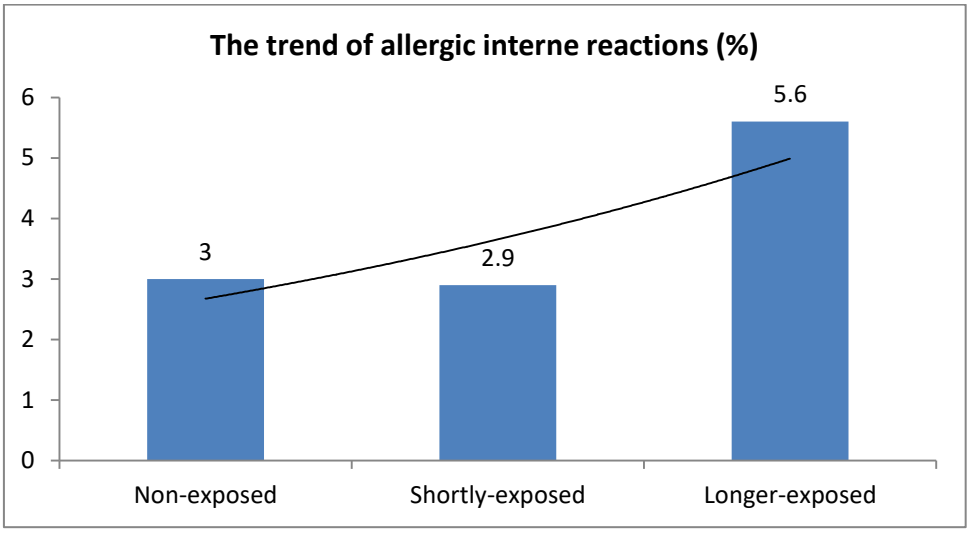

Fig 4: The trend of internal allergic reactions

Table 2: Correlation's trend between latex allergy and reported additional allergies, positive prick tests and food allergy among dental students

Correlation's trend between latex allergy and reported additional allergies, positive prick tests and food allergy						
Variables	Non-exposed (n=33)		Shortly-exposed (n=136)		Longer exposed (=71)	
	r	p	r	p	r	p
Additional allergies non-related to latex-exposure in:						
Subjects with suspected allergy to latex	-0.14907	.399	.062	.470	.184	.126
Subjects with irritant dermatitis to latex	-.134	.450	.042	.628	.082	.498
Subjects with skin allergy reaction to latex	-.056	.752	.053	.541	.278	.021
Subjects with internal organ allergy to latex	-.056	.752	-.072	.401	-.061	.615
Previous positive allergy tests in:						
Subjects with suspected allergy to latex	-0.08333	.637	-.042	.625	-.072	.546
Subjects with irritant dermatitis to latex	-.075	.673	.006	.947	-.052	.662
Subjects with skin allergy reaction to latex	-.031	.860	.012	.892	-.010	.935
Subjects with internal organ allergy to latex	-.031	.860	-.044	.613	-.060	.617
Previous food allergies						
Subjects with suspected allergy to latex	-0.17072	.323	.325	<0.001	.249	.032
Subjects with irritant dermatitis to latex	.122	.479	.270	.001	.206	.075
Subjects with skin allergy reaction to latex	-.064	.711	.262	.002	.387	.001
Subjects with internal organ allergy to latex	-.064	.711	.246	.003	.268	.021

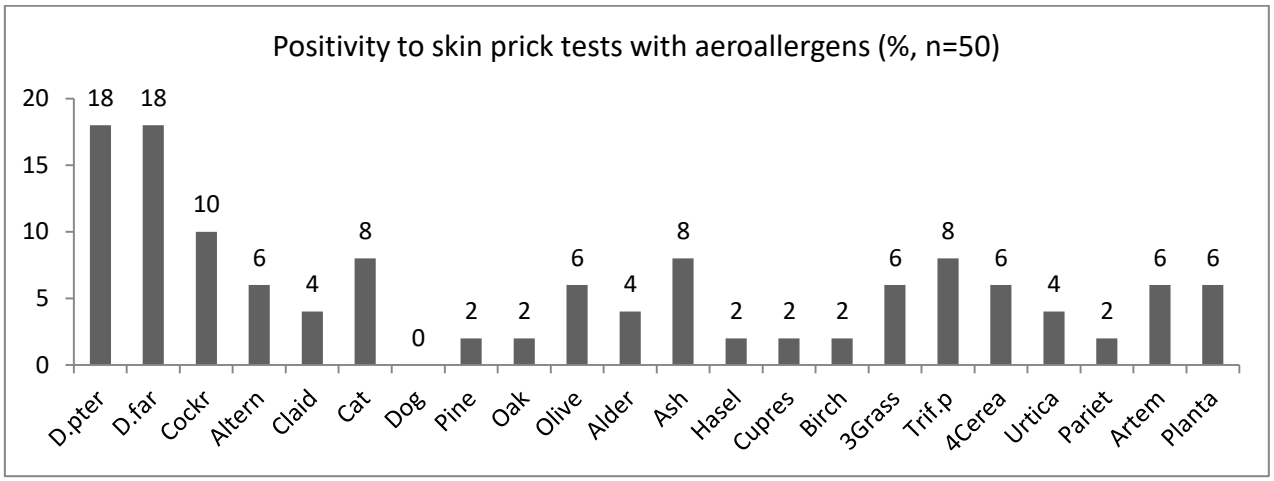

Fig 5: Positivity to skin prick tests with aeroallergens (%)

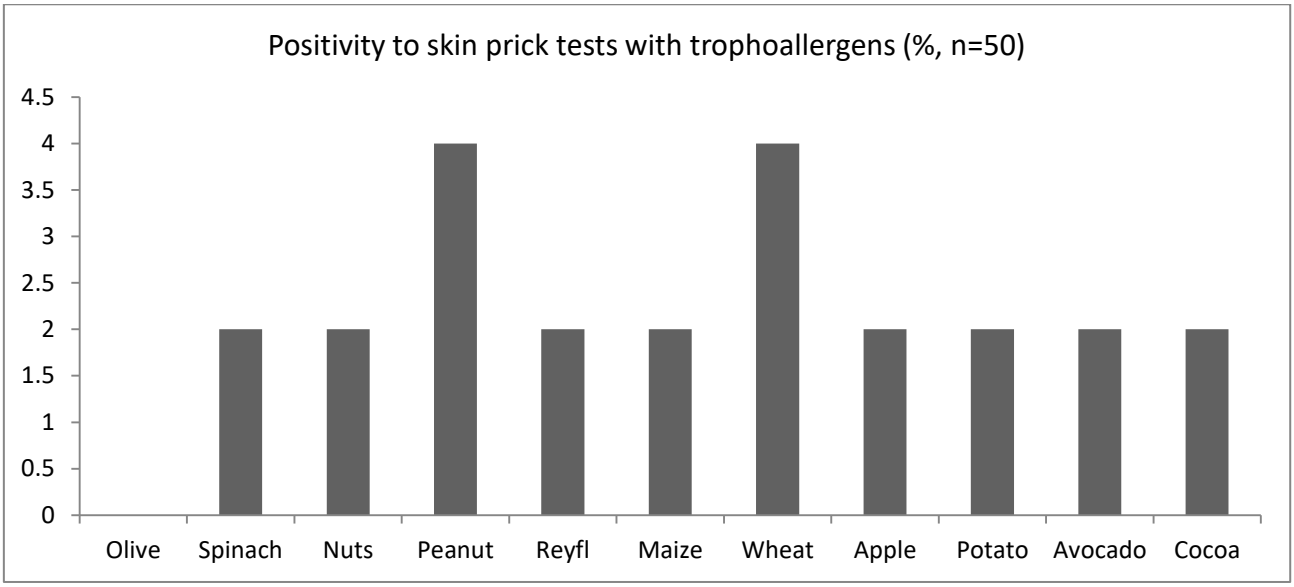

Fig 6: Positivity to skin prick tests with trophoallergens (%)

DISCUSSION

Latex allergy is a major occupational health problem in health care workers, affecting 0.5 to 18% of subgroups at risk [1-2, 11-15]. Recent epidemiologic findings agree with some items in our self-administrated questionnaire, which reports for natural rubber latex allergy among dental students on 10% of cases, hand erythema especially after latex glove wearing in more than 12%, or hand eczema in 14% of subjects.

Our questionnaire items have shown a progressive trend of latex allergy prevalence in concordance with latex exposure along school practice, overwhelming significantly the value of 20%. This includes self-reporting of latex allergy, occurrence of allergic and irritant contact dermatitis, whereas respiratory symptoms were reported in a more limited proportion. A similar prevalence progression for allergic and irritant skin symptoms is observed in an additional study among dental students, reporting for a significant difference between students of first to third year and them of fourth to sixth year [2]. Also, this trend is demonstrated in a survey among dental workers in military dental centers [16]. The increased prevalence over 20% in our subpopulation could be related to the gloves quality, which consists both on more efficacious protection level against biological materials (compared to gloves of different material) and on high concentration level for the natural rubber latex (as compared to nitrile gloves) [8,13,16-17].

This demonstrates that latex exposure plays a decisive role on the development of hypersensitivity to natural rubber latex gloves, indicating also that the latex glove avoidance could be an effective prevention measure against latex allergy [18-19]. Maybe simple measures such as the use of non-powdered latex gloves

and use of latex-free gloves by sensitized subjects could interrupt the progression of latex symptoms, and probably, may avoid new cases of sensitization [20].

Similarly to this study, previous surveys have noted that history of personal food allergy, or atopic respiratory symptoms are more frequent among individuals with latex allergy [2-4, 7-8, 12]. The longer powdered latex-exposed students have reported more frequently about additional atopic pathologies such as respiratory and food allergies, even if this trend is not demonstrated by skin prick tests to atopenes. With respect to reported food allergy, it is determined a consistent correlation even after short latex exposure, especially among students who developed skin allergic symptoms. In addition, skin prick tests to aeroallergens revealed a mono- or polysensitisation in 38% of students, which included house dust mites, cockroach, cat's epithelia, grasses and ash pollens, etc. Meanwhile, skin prick tests to trophoallergens revealed a mono- or polysensitisation in 12% of subjects, and the most important allergens were peanut and wheat allergens.

Despite the discrepancies between authors, in general is accepted that personal atopy and development of respective pathologies are believed to be important risk factors for the occurrence of latex allergy as compared to familiar history for atopic diseases, age, etc [3,4,9-12,15,21-23]. As responsible allergens are mostly considered pollen grains like grasses, tropical fruits, chestnuts, etc, which partly agree with our data [10, 12, 15, 23-25]. Similarly to literature data, our study revealed increased sensitizations' rates among the latex-allergic subjects (as compared to general population) with respect to the allergens that are responsible for causation of atopic diseases [15, 25-32]. In concert with effect of duration in the service and wearing gloves for a longer period of time, the increased prevalence of sensitization to these atopenes suggest that environmental factors rather than genetic predisposition play the major role and are a real risk factor in the development of this condition [22,24].

CONCLUSION

This study reinforces the conclusion that it is essential to recognize which professionals are sensitized to latex in order to provide appropriate treatment and to establish adequate prevention [3]. A positive history for allergic and irritant symptoms, as determined by questionnaire is a significant predictor of a positive response to latex antigens. Its combination with positive diagnostic tests reinforces the confirmation of suspected latex allergy, especially when pathology is already installed. This study also demonstrated that latex allergy patients are more predisposed to be sensitized to aeroallergens and trophoallergens as compared to general population, and this predisposition can be considered important risk factor for development of food allergy and respiratory allergic diseases.

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