

Hand eczema among Lebanese dentists: An epidemiological study

Wyprysk rąk u libańskich lekarzy dentystów – badanie epidemiologiczne

Samar Bou Jaoude^{1,A–D}, Nada Naaman^{1,E}, Edgard Nehme^{1,E}, Jeanine Gebeily^{1,E}, Maha Daou^{2,A,E,F}

¹ Department of Oral Pathology, Faculty of Dental Medicine, Saint-Joseph University, Beirut, Lebanon

² Research Section, Faculty of Dental Medicine, Saint-Joseph University, Beirut, Lebanon

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation;

D – writing the article; E – critical revision of the article; F – final approval of the article

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Address for correspondence

Samar Bou Jaoude

E-mail: samar.boujaoudeh@usj.edu.lb

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Abstract

Background. Dentists are at risk of developing hand eczema, as are most people who work in the health care field.

Objectives. The objective of this study was to investigate the prevalence of hand eczema and allergies among a sample of Lebanese dentists to understand their probable causes and propose solutions to reduce their occurrence.

Material and methods. A total of 314 Lebanese dentists, who practiced different specialties of dentistry, after giving verbal consent, completed an anonymous questionnaire that focused on occupational diseases. This study was approved by the ethics committee of Saint-Joseph University (USJ) of Beirut, Lebanon. The statistical analyses were performed using SPSS software for Windows. The alpha error was set to 0.05.

Results. The mean age of the participants was 39.2 (± 11.66) years (58.6% male). The results showed that 15.3% ($n = 48$) of the surveyed dentists developed allergies to latex gloves, 2.5% ($n = 8$) developed allergies to resins, and 3.8% ($n = 12$) developed allergies to glutaraldehyde.

Conclusions. This study showed that a large number of Lebanese dentists suffer from hand eczema. It is important to note that not all skin reactions are related to gloves or natural rubber latex. Dentists should be aware of hand eczema symptoms, the common allergens contained in dental materials, the prevention and the appropriate treatment of occupational skin diseases.

Key words: latex, occupational disease, gloves, glutaraldehyde, methacrylate

Słowa kluczowe: lateks, choroba zawodowa, rękawice, aldehyd glutarowy, metakrylan

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Dermatitis, or eczematous dermatitis, is an inflammatory response of the skin to various extrinsic and intrinsic agents. Occupational hand dermatitis has been a particular problem for the worker in the medical field, including dentists. The 2 major forms of dermatitis are contact dermatitis and atopic dermatitis.¹ Dental materials used for dental care constitute a major risk of inducing allergic reactions in patients and dentists.² Allergic contact dermatitis (ACD) manifestations vary among individuals, and dental personnel is more likely to develop hand dermatitis, while patients with ACD caused by dental materials tend to develop stomatitis or cheilitis (type IV allergy) or contact urticaria (immediate – type I allergy).³

The adoption of universal precautions in response to concerns about the transmission of human immunodeficiency virus (HIV) and other viruses has led to an increase in hand eczema from gloves and an increase in the frequency of irritant contact dermatitis.^{3,4} In their work during dental treatment, dentists also use several products and handle polymer resin materials, which are known to be skin irritant, causing contact allergies and/or irritation of the skin and mucous membranes.⁵ Additionally, frequent hand washing and the use of protective gloves for many hours per day contribute to an unfavorable environment for the skin of the hands.⁶ Furthermore, cosmetic dentistry is becoming more popular, exposing dental workers to resins, bleaches and adhesives, with such components as acrylic and methacrylic-based materials causing hand eczema.^{3,5}

Nevertheless, little is known about the current prevalence of hand eczema among Lebanese dentists, and only a limited amount of published information is available, only 1 epidemiological study was realized in 2005.⁷ Thus, the purpose of this study was to investigate the epidemiology of hand eczema symptoms and allergies among Lebanese dentists, to try to understand their probable causes and to propose solutions that would reduce their occurrence.

Material and methods

This was an observational cross-sectional study. This research and its consent procedure were approved by the ethics committee of the Saint-Joseph University (USJ) Beirut, Lebanon, in accordance with the World Medical Association Declaration of Helsinki. A questionnaire focused on hand eczema was prepared. The questionnaire was pretested and auto-administrated on a sample of 30 dentists arbitrarily chosen from the dental school of USJ. Improvements of this questionnaire were done according to this pilot study. Thereafter, the improved questionnaire was distributed to the general dental practitioners (GDPs) and specialists who attended the 3-day francophone symposium orga-

nized by USJ in 2014. This questionnaire was auto-administrated by each participant. The inclusion criteria were the Lebanese dentists from among the dentists who accepted to fulfill the questionnaire. The non-Lebanese dentists that were attending the dental symposium were excluded from the study. 1,100 Lebanese and non-Lebanese dentists were present during the 3-day francophone symposium (including the instructors). A sample of 350 Lebanese dentists was randomly selected using the random number table. The response rate was 90%, since 314 dentists accepted to participate in the study.

The outcome variable of the study was the presence of hand eczema (Yes/No) in dentists. The predictor variables of the study were: age, gender, years of dental practice, dental specialty, mean number of working days per week, number of patients treated per day, mean hours of wearing gloves per week, presence of a dental assistant (Yes/No), allergic predisposition (Yes/No), handling composite with fingers (Yes/No), type of X-rays used (normal/digital).

The statistical analyses were performed using statistical package software for social sciences (SPSS) for Windows (v. 18.0, Chicago, USA). The alpha error was set at 0.05. The normality distributions of the continuous variables were assessed with the Kolmogorov-Smirnov test. Univariate analyses were performed to assess the association of each predictor factor with hand eczema. The χ^2 square test and Fisher's exact test were used for categorical variables and the Student/Mann-Whitney tests were used for continuous variables. Logistic regression analysis was used with hand eczema as the dependent variable. Predictor variables that showed associations with $p < 0.250$ in univariate analyses were candidates for the multivariate model, according to the Enter method.⁸ Collinearity among independent variables was also tested. Highly correlated independent variables were excluded.

Results

A total of 314 dentists (184 male and 130 female), aged 39.2 ± 11.66 years, completed the questionnaire (Table 1).

The mean number of dental working years was 15.50 ± 11.18 (range: 0–45 years), the mean working days per week was 4.68 ± 1.11 (range: 1–7).

Our results showed that 10.2% ($n = 32$) of participants developed hand eczema, 71.9% ($n = 23$) of whom had contact dermatitis, 15.6% ($n = 5$) had atopic dermatitis, and 12.5% did not specify. On the other hand, 15.3% ($n = 48$) of the surveyed dentists developed allergies to latex gloves, 2.5% ($n = 8$) developed allergies to resins, and 3.8% ($n = 12$) developed allergies to glutaraldehyde. The results revealed that dentists wore gloves at a rate

Table 1. Sociodemographic characteristics of the participants. Percentage is more than 100% due to duplicate answers. Fisher's Exact test

Explicative variable	n	%
Marital status (n = 314)		
married	179	57.0
single	126	40.1
divorced	3	1.0
widowed	3	1.0
no answer	3	1.0
General practitioner (n = 314)		
yes	144	45.9
no	164	52.2
no answer	6	1.9
Specialty (n = 314)		
restorative and prosthetic dentistry	79	25.2
orthodontics	34	10.8
surgery	33	10.5
endodontics	32	10.2
periodontology	31	9.9
pediatric dentistry	24	7.6
oral pathology	5	1.6
oral radiology	1	0.3
no answer	86	27.4

Table 2. Continuous variables associated with hand eczema. Student's t-test or Mann-Whitney test

Explicative variable	Hand eczema	N	Mean	SD	p-value
Age	yes	30	37.97	10.614	0.584
	no	259	39.20	11.831	
Years of dental practice	yes	32	14.50	9.935	0.629
	no	258	15.52	11.386	
Working days per week	yes	31	4.84	1.098	0.432
	no	260	4.67	1.110	
Number of patients treated per day	yes	31	9.26	4.966	0.389
	no	259	8.34	5.673	
Hours of wearing gloves per week	yes	26	30.65	14.519	0.699
	no	238	29.51	14.267	
Years of wearing gloves	yes	25	13.80	7.874	0.697
	no	245	14.53	8.957	

of 29.54 ±14.24 hours per week (n = 267) for over 14.51 ±8.82 years (n = 274).

Concerning allergic predisposition, 5.1% (n = 16) complained of asthma and 10.2% (n = 32) of pollen allergies.

Univariate analyses showed that age, years of dental practice, number of working days per week, number of patient treated per day, number of hours and years

of wearing gloves were not significantly associated with hand eczema in dentist (p > 0.05) (Table 2). Moreover, gender, specialty, presence of dental assistant and type of radiography used in dental practice were not significantly associated with hand eczema (p > 0.05) (Table 3).

Multivariate analyses revealed that dentists who manipulate the composite with their fingers were 10.3 times more at risk to develop hand eczema compared to dentists who do not manipulate composite with fingers (p-value = 0.008). Moreover, dentists who had developed allergy to resins, latex, aerosol and glutaraldehyde were 5.4 times more at risk to develop hand eczema than dentists who had not developed an allergy (p-value < 0.001). Asthma and allergy to pollen were not associated with hand eczema (p-value = 0.216) (Tables 4, 5).

Table 3. Categorical variables associated with hand eczema. χ^2 test or Fisher's exact test

Explicative variable	Hand eczema				p-value
	yes		no		
	n	%	n	%	
Gender					
male	23	71.9	154	57.5	0.117
female	9	28.1	114	42.5	
total	32	100.0	268	100.0	
GDP					
yes	12	37.5	128	48.7	0.232
no	20	62.5	135	51.3	
total	32	100.0	263	100.0	
Dental assistant					
yes	26	81.2	194	74.0	0.375
no	6	18.8	68	26.0	
total	32	100.0	262	100.0	
Allergy					
yes	17	58.6	47	20.9	<0.001
no	12	41.4	178	79.1	
total	29	100.0	225	100.0	
Handling composite with fingers					
yes	5	15.6	7	2.8	0.006
no	27	84.4	246	97.2	
total	32	100.0	253	100.0	
Type of X-rays used					
normal	12	38.7	101	39.3	0.133
digital	15	48.4	149	58.0	
any	4	12.9	5	1.9	
both	0	0.0	2	0.8	
total	31	100.0	257	100.0	

Table 4. Logistic regression model of the predictor variables associated with hand eczema

Explicative variable	B	Standard Error	Degree of freedom	Sig.	Exp (B)	95.0% CI for Exp (B)	
						lower	upper
Allergy	1.691	0.440	1	0.000	5.427	2.291	12.854
Gender	0.912	0.486	1	0.060	2.489	0.961	6.447
Composite/ fingers	2.336	0.874	1	0.008	10.340	1.866	57.307
X-Ray type	-0.076	0.193	1	0.696	0.927	0.635	1.354
Constant	-6.374	2.084	1	0.002	0.002		

B – beta coefficient; Sig. – significance or p-value; Exp (B) – odds ratio. Multivariate logistic regression model.

Table 5. Allergic predisposition to dental materials or others and hand eczema in dentists. χ^2 test and Fisher's exact test

Hand eczema	Hand eczema				p-value
	yes		no		
	n	%	n	%	
Allergy to					
latex (gloves)	10	34.5	31	13.8	
resins (methyl methacrylate)	2	6.9	2	0.9	
glutaraldehyde	3	10.3	4	1.8	
aerosols	0	0.0	1	0.4	
no allergy	12	41.4	178	79.1	<0.0001
others	0	0.0	5	2.2	
latex and resins	2	6.9	1	0.4	
latex and glutaraldehyde	0	0.0	2	0.9	
glutaraldehyde and aerosols	0	0.0	1	0.4	
total	29	100.0	225	100.0	
Allergic predisposition to					
pollen	2	6.5	31	13.5	
asthma	4	12.9	12	5.2	
no allergy predisposition	19	61.3	163	70.9	0.216
other	6	19.4	21	9.1	
pollen and asthma	0	0.0	3	1.3	
total	31	100.0	230	100.0	

Discussion

Our statistics revealed that 10.2% of the Lebanese dentists developed hand eczema, while a study realized in Sweden reported that 20% had hand dermatitis.⁹ Extensive contact with water and soap caused by frequent hand washing after each patient, given that the average number of patients received per day, according to our statistics, was 8.43 ± 5.57 , is a well-known risk factor for irritant contact dermatitis.¹⁰

The prevalence of latex allergies among Lebanese dentists revealed that 15.3% of them had been medically diagnosed with latex allergies, while 2.1% in Queensland, Australia, have been diagnosed. This is due to the extensive use of latex gloves the medical field and domestically.¹ Furthermore, our study showed that Lebanese dentists used latex gloves for 14.51 ± 8.82 years, and rubber latex gloves can cause delayed allergies (type IV), with a reaction usually occurring 24–96 hours after exposure, as well as immediate (type I) allergic reactions.^{11–12}

Hand eczema caused by acrylates and methacrylates is considered to be one of the more common occupational diseases, affecting mainly dental care personnel (dentists, dental assistants and prosthetics technicians).¹³ Acrylic monomers are considered to be potent sensitizers and acrylic resins have the potential to induce cytotoxic, irritant and/or contact allergic reactions, whereas this capacity is absent or significantly reduced after polymerization, which is incomplete or at best 83%.^{13–16} Methyl methacrylate, as a small molecular acrylate, can permeate thin protective disposable gloves; protective gloves are insufficient due to the permeability of natural rubber latex and vinyl gloves to these substances.^{17–21} With the growing evolution of cosmetic dentistry, which exposes dental workers to resins, bleaches and adhesives, com-

posed of acrylic- and methacrylic-based materials that can cause hand eczema, more dentists are exposed to methyl methacrylate.^{3,5} Previous studies in Serbia¹⁷ and in Valencia, Spain,²² reported that 5–25% of dental personnel might be sensitized to methyl methacrylate, while our study revealed that 2.5% ($n = 8$) developed this type of allergy. Since most of the Lebanese dentists send acrylic work to prosthetics technicians (e.g., temporary crowns, dentures, etc.), they are less exposed to non-polymerized methyl methacrylate.

Glutaraldehyde is considered the disinfectant of choice for sterilizing medical and dental equipment; it fixes cell membranes, blocks the release of cellular components and therefore kills the micro-organisms.^{23,24} Despite published case reports and patch testing results indicating its potential for sensitization and other toxic reactions, glutaraldehyde remains the sterilizing agent of choice in the cleaning of medical and dental equipment. This is due to its affordable cost, disponibility, disinfectant properties, stability, and the absence of any significant harmful effects on equipment.²⁵

Unfortunately, glutaraldehyde has many toxic side effects, including the ability to induce hand eczema.²³ Hand eczema caused by glutaraldehyde is common in Lebanese dentists; 3.8% ($n = 12$) of Lebanese dentists developed allergies to glutaraldehyde, while 10.3% ($n = 3$) developed allergies to glutaraldehyde associated with hand eczema. Statistics from Kansas, USA, revealed that 4% of dentists developed allergies to glutaraldehyde, which was in accordance with our results.²⁶

Understanding the causes of hand eczema in dental care workers is important for developing strategies for prevention. The recommended procedure to reduce the occurrence of hand eczema caused by latex gloves is to reduce the exposure of the dentist to natural rubber latex (NRL) protein. Avoidance is the only effective option, so the affected dentist should initially change to free-powdered, latex gloves to minimize the incidence of allergy to latex.²⁷ If this step is unsuccessful, they should change to non-latex gloves or should wear glove liners under their latex gloves.²⁸ Additionally, washing the hands frequently after the use of gloves could help remove irritants causing allergy.²⁷ Dentists with known NRL protein hypersensitivity should use only non-latex (nitrile) gloves and should undertake proper hand care in the form of topical moisturizers and corticosteroid- or antihistamine-containing ointments, which is why the usage of nitrile gloves is the most important preventive measure in the dental occupation.^{17,28}

To prevent hand eczema caused by methyl methacrylates, it is important to develop no-touch techniques to avoid skin exposure to these chemicals.²⁹ Additionally, protection can be improved using nitrile rubber gloves or double gloving to prevent small molecular acrylates from permeating the gloves; in this manner, direct skin contact could be avoided.¹⁷

Despite the awareness that glutaraldehyde induces hand eczema, the rate of the allergy has appeared to increase constantly, which is why it is necessary for dentists exposed to glutaraldehyde to heighten occupational safety standards and improve the methods of barrier protection until a less sensitizing disinfectant is developed.²³

In addition, hand eczema caused by commercial hand cleansers occurred more frequently than hand eczema caused by alcohol-based hand rubs (ABHRs), which why we recommend the use of ABHRs daily in dental clinics.³⁰

Conclusion

This study showed that Lebanese dentists suffer from hand eczema. Within the limitations of this study, especially the limited number of participants, our study confirmed that hand eczema constitutes a health problem for dentists.

It is important to note that not all skin reactions are related to gloves or natural rubber latex. Dental professionals should be conscious of the chemical allergens used in their daily practice, the symptoms of hand eczema, and their correct treatment.

In addition, skin care advice should be incorporated into hand hygiene education. Dermatologists must be kept abreast of the newer allergenic materials and products used in dentistry to diagnose and treat hand eczema correctly.

Given that, hand eczema may have medical, social, occupational, and subsequently financial repercussions. It is important to note that this occupational health problem should be highlighted at all clinical and research symposia to achieve greater awareness.

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