Contact sensitisation in adults: a 5-year retrospective review in hospital Kuala Lumpur

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ABSTRACT

Background: The pattern of contact sensitisation should be monitored in order to detect the changing trend of sensitising allergens. We aim to evaluate contact sensitisation in adults suspected to have allergic contact dermatitis.

Methods: This is a five-year retrospective review on contact sensitisation in adults patch-tested with the European Standard and extended series between 2011 and 2015 in the Department of Dermatology, Hospital Kuala Lumpur.

Results: There were 689 adults (M:F= 1:2.04; mean age 40.5 years) who were patch-tested. The majority (175, 25.4%) were white collar workers and 118 (17.1%) were healthcare workers. The provisional diagnoses of patients included contact dermatitis (80.8%); endogenous eczema (7.9%); hand eczema (3.2%); hand and foot eczema (3.5%); foot eczema (1.4%) and photodermatitis (1.2%). The allergens selected for testing were based on past and present history of exposure. Almost all (688, 99.8%) were patch-tested with the European standard allergens and 466 (67.6%) were tested with the extended series. About three quarter (528, 76.6%) developed at least one positive reaction. The top five most frequent reactions were to nickel sulphate (35.3%); potassium dichromate (16.5%); methylchloroisothiazolinone (12.9%), fragrance mix I (12.6%), and cobalt chloride (10.2%). The commonest sensitisations identified in the extended series were palladium chloride (23/105, 21.9%), stannous chloride (18/85, 21.2%), miconazole (7/44, 15.9%), gold(I)sodium thiosulfate (16/105, 15.2%) and thimerosal (29/202, 14.4%).

Conclusion: Contact sensitisation was detected in 76.6% of adults patch-tested. Nickel sulphate was found to be the most frequently sensitising allergen. The rising prevalence of methylchloroisothiazolinone/methylisothiazolinone sensitization poses significant concern.

KEY WORDS:
Contact sensitisation; patch test; nickel; European standard; contact dermatitis

INTRODUCTION

Eczema or dermatitis is one of the commonest skin conditions throughout the world. Contact dermatitis constitutes an important subset of this large group of patients. Patch testing is the most important diagnostic tool for allergic contact dermatitis. Surveillance on the prevalence of contact allergy of patch-tested patients is proven sentinel in detecting the types as well as the trends of contact material exposed in each population over time. Significant changes in both findings will require revision of allergens used in standard series and tailored to different populations in each geographical region. Some of the allergens used for patch testing in the standard series have been changed over the years and this relates to the changes of environmental exposures.

The objective of this study is to describe the contact sensitisation in adults suspected to have allergic contact dermatitis in a tertiary dermatology centre in Malaysia.

MATERIALS AND METHODS

Patients

This is a retrospective study which reviewed the case notes of all patients aged more than 18 years old, who had been patch- tested in Hospital Kuala Lumpur between 2011 and 2015. A total of 689 patients were included. Based on patients' history of exposure, all were patch-tested with Standard European Series and the relevant extended series. IQ Chambers™ (Chemotechnique Diagnostic) made of additive free polyethylene plastic on hypoallergenic non-woven adhesive tape, were attached to the upper back of patients. The patches were removed after 48 hours. Patch test reading was performed by a dermatologist at 48 hours and 96 hours after the test application in accordance to the International Contact Dermatitis Research Group recommendation.[1,2] Irritant reactions were excluded from data analysis. Patients were instructed not to shower, perform strenuous activities or exercises that will cause excessive sweating. They were also instructed not to rub or scratch the back, avoid systemic corticosteroids during the test and avoid sun exposure over the back.

Statistical analysis

The demographic data were analysed using descriptive statistics. The patch test results were analysed with Fisher's exact test where appropriate. A p-value <0.05 was considered to be statistically significant. Statistical analysis was done using SPSS version 22.0 (IBM Corp, Armonk, NY, USA).

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RESULTS

Patients' characteristics

Over the five years, a total of 689 patients, 226 males (32.8%) and 463 females (67.2%) (M:F ratio, 1:2.04) were patched tested. The average age of patients was 40.5 years (range: 18-76 years). More than half of the patients were Malays (389, 56.5%), followed by Chinese (148, 21.5%), Indians (133, 19.3%), foreigners (6, 0.9%) and other ethnic groups (13, 1.9%). A quarter of the patients were white collar workers (25.4%), followed by blue collar workers (17.6%), healthcare workers (17.1%), pink collar workers (6.0%) and unemployed (24.5%). White-collar workers are those who work in office or other administrative settings. Blue-collar workers included manual laborers. Pink-collar jobs referred to those in the service industry e.g., beauticians, models, sales and customer service. The unemployed consisted of housewives, retirees and students.

The provisional diagnoses of the cohort were contact dermatitis (557, 80.8%), endogenous eczema (54, 7.9%), hand eczema (22, 3.2%), hand and foot eczema (24, 3.5%), foot eczema (10, 1.4%) and photodermatitis (8, 1.2%). The demographic data of patients are shown in Table I.

Patch testing results

Six hundred eighty-eight patients (99.8%) were patch tested with European standard series. One patient was patched tested with dental series only. There were 528 patients (76.6%) who developed at least one positive reaction to an allergen. Out of these 528 patients, 484 patients (91.7%) developed reactions to the allergens from European standard series.

There were 466 patients who were patch-tested with extended series based on the exposure history elicited. There were 176 (25.5%) patients patch-tested with the cosmetic series; 117(17%) rubber series; 85 (12.3%) metal series; 53(7.7%), shoe series; 46 (6.7%) textile and leather series; 46 (6.7%) corticosteroid series; 44 (6.4%) antimicrobial series; 39 (5.7%) hair dressing series; 30 (4.4%) dental series; 21 (3%) photoallergens; and 13 (1.9%) plastic and glue series. Of these, 160 (34.3%) patients developed positive reaction to at least one allergen in the extended series. Furthermore, 243 patients had their own products patch-tested and 64 (26.3%) developed reactions to their own products. These included various cosmetic products, shampoos, conditioners, tooth paste, hair dye, detergents and other toiletries.

There were 31 patients (4.5%) with a negative reaction to European standard series, but a positive reaction to the extended series. Another 13 patients (1.9%) developed positive reactions to their own products but tested negative to both the European standard and extended series. Among those who had at least one positive patch test result, 171 (32.6%) had a history of atopy (atopic dermatitis, bronchial asthma and allergic rhinitis). Nevertheless, the history of atopy was not established in 109 patients (15.8%).

The results of the European standard series are summarised in Table II. In general, the top five most frequently encountered allergens are nickel (35.3%), followed by potassium dichromate (16.5%), methylchloroisothizolinone (12.9%), fragrance mix I (12.6%) and cobalt chloride (10.2%). The pattern of sensitisation to certain allergens differed by gender as shown in Table II. Females were significantly more sensitised to nickel (42.1%, p<0.001; OR= 2.705; 95% CI=1.874-3.915), methychloroisothizolinone (16.6%, p<0.001; OR = 3.567; 95% CI=1.898-6.702), fragrance mix I (15.1%, p = 0.005; OR= 2.195; 95% CI=1.259-3.828), balsam of Peru (8.9%, p=0.02; OR=2.348; 95% CI= 1.121-4.921) and epoxy resin (1.9%, p=0.03). Co-sensitisation of nickel and cobalt occurred in 47 patients (6.8%), of which 5.08% were females and 1.74% were males (p=0.365). On the other hand, co-sensitisation of chromium and cobalt was detected in 27 patients (3.9%) in this audit of which 1.9% occurred in male and 2% in female (p=0.084). As for mercapto-benzothiazole, chloramphenicol, budesonide, and mercapto mix; each allergens each shows less than 1% of sensitisation rate.

The commonest sensitisations identified in the extended series were to palladium chloride (23/105, 21.9%), stannous chloride (18/85, 21.2%), miconazole (7/44, 15.9%), gold(I) sodium thiosulfate (16/105, 15.2%) and thimerosol (29/202, 14.4%). Stannous chloride, palladium chloride and gold(I)sodium thiosulfate dihydrate are allergens in metal and dental series. There were 105 patients in our cohort who were patch-tested with the metal and/or dental series. Miconazole is one of the allergens in topical antimicrobial series while thimerosal is in both cosmetic and dental series. There were 202 patients in our cohort who were patch-tested with cosmetic and/or dental series.

Table III demonstrated top 5 sensitising allergens according to occupations. There were no significant differences in terms of sensitisation pattern with the type of occupations engaged.

DISCUSSION

Using the European standard series alone detected a sensitisation rate in our cohort of 70.2%. The detection rate of contact sensitisation in our cohort by using European standard series only was about 91.7%. Additional testing with the relevant extended series detected another 4.5% rate of sensitisation. Testing the patient's own products identified an additional 1.9% sensitisation rate. Therefore, patch testing with patients' own products is important. In our study, 32.6% of those who had positive patch test reactions are atopic. However, its significance could not be confirmed as information on atopy for 109 patients were not available. Atopy appears to have no correlation with the frequency of patients with positive patch test reactions in some studies.[3,4] Hence the indication of patch testing in atopic subjects is the same as in other patients. Nevertheless, the interpretation of the patch test results in patients with atopic dermatitis may be challenging as they have hyper-reactive skin with a risk of false positive reactions. Filaggrin null mutation which leads to impaired epidermal barrier function has been identified as one of the pathogenesis of atopic dermatitis.[5] This filaggrin gene mutation has been reported to increase slightly the risk of contact sensitisation[6] especially for nickel sensitisation.[7]

Nickel sulphate is commonly found in jewellery such as earrings, necklace, rings and watches. It is also found in a

Table I: Demographic data of 689 adults underwent patch testing

Characteristic		n=689
M:F ratio		1:2.04
Mean age at patch test in years (range)		40.5 (18-76)
Occupations, n(%)	White collar workers	175 (25.4%)
	Healthcare workers	118 (17.1%)
	Blue Collar	121 (17.6%)
	Pink collar	41 (6.0%)
	Unemployed	169 (24.5%)
Provisional diagnosis, n (%)	Contact dermatitis	557 (80.8%)
	Endogenous eczema	54 (7.9%)
	Hand eczema	22 (3.2%)
	Hand & foot eczema	24 (3.5%)
	Foot eczema	10 (1.4%)
	Photodermatitis	8 (1.2%)
	Others	14 (2%)
Number with at least one positive reaction (%)		528 (76.6%)
Number with positive reaction in ES series (%)		484 (70.2%)
Number with positive reaction in ExtS (%)		157 (22.8%)
Number with positive reaction to testing own products (%)		64 (26.3%)
Number with negative reaction in ES but positive in ExtS (%)		31 (4.5%)
Number with negative reaction in ES & ExtS but positive reaction with testing own products (%)		13 (1.9%)

ES- European Standard; ExtS- Extended Series

Table II: Reactions to allergens in European standard series ranking from highest to lowest prevalence (n=688)

No	European Standard	Conc (%)	All (n=688)	Male (n=226)	Female (n=462)	p-value	OR	95% CI
1	Nickel sulfate	5%	243 (35.3%)	48 (21.2%)	195 (42.1%)	<0.001	2.71	1.87 - 3.92
2	Potassium dichromate	0.5%	114 (16.5%)	41 (18.1%)	73 (15.8%)	0.45	0.85	0.56 – 1.29
3	Methylchloroisothiazolinone+ Methylisothiazolinone	0.01%	89 (12.9%)	12 (5.3%)	77 (16.6%)	<0.001	3.57	1.90 – 6.70
4	Fragrance Mix I	8%	87 (12.6%)	17 (7.5%)	70 (15.1%)	0.005	2.20	1.26 – 3.83
5	Cobalt chloride	1%	70 (10.2%)	20 (8.8%)	50 (10.8%)	0.50	1.25	0.73 – 2.16
6	Fragrance Mix II	14%	60 (8.7%)	13 (5.8%)	47 (10.2%)	0.06	1.86	0.98 – 3.51
7	Balsam of Peru	1%	50 (7.3%)	9 (4.0%)	41 (8.9%)	0.02	2.35	1.12 – 4.92
8	4- phenylenediamine base	1%	46 (6.7%)	21 (9.3%)	25 (5.4%)	0.07	0.56	0.31 – 1.02
9	Neomycin sulfate	20%	42 (6.1%)	10 (4.4%)	32 (6.9%)	0.24	1.61	0.78 – 3.33
10	Colophony	20%	39 (5.7%)	13 (5.8%)	26 (5.6%)	1.0	0.98	0.49 – 1.94
11	Methyldibromoglutoronitrile	0.5%	25 (3.6%)	8 (4.0%)	17 (3.7%)	0.93	1.04	0.44 – 2.45
12	Lyral	5.0%	24 (3.5%)	5 (2.2%)	19 (4.1%)	0.27	1.90	0.70 – 5.14
13	Formaldehyde	2%	21 (3.0%)	5 (2.2%)	16 (3.5%)	0.48	1.59	0.57 – 4.38
14	Thiuram Mix	1%	18 (2.6%)	6 (2.7%)	12 (2.6%)	1.0	0.98	0.36 – 2.64
15	Wool Alcohols	30%	14 (2.0%)	3 (1.3%)	11 (2.4%)	0.56	1.81	0.50 – 6.56
16	Flavin		14 (2.0%)	6 (2.7%)	8 (1.7%)	0.41	0.65	0.22 – 1.89
17	Benzocaine	5%	12 (1.7%)	4 (1.8%)	8 (1.7%)	1.0	0.98	0.29 – 3.28
18	Clioquinol	5%	11 (1.6%)	5 (2.2%)	6 (1.3%)	0.35	0.58	0.18 – 1.93
19	4- tert- butylphenol Formaldehyde Resin	1%	11 (1.6%)	4 (1.8%)	7 (1.5%)	0.76	0.85	0.25 – 2.95
20	Quarternium 15	1%	11 (1.6%)	3 (1.3%)	8 (1.7%)	1.0	1.31	0.34 – 4.99
21	N-isopropyl-N-Phenyl paraphenylenediamine	0.1%	10 (1.5%)	2 (0.9%)	8 (1.7%)	0.51	1.97	0.42 – 9.37
22	Sesquiterpene Lactone Mix	0.1%	10 (1.5%)	2 (0.9%)	8 (1.7%)	0.51	1.97	0.42 – 9.37
23	Epoxy Resin	1%	9 (1.3%)	0	9 (1.9%)	0.03	N/A	N/A
24	Paraben mix	16%	9 (1.3%)	2 (0.9%)	7 (1.5%)	0.73	1.72	0.36 – 8.36
25	Primin	0.01%	7 (1.0%)	3 (1.3%)	4 (0.9%)	0.69	0.65	0.14 – 2.93
26	Tixocortol-21-pivalate	0.1%	7 (1.0%)	5 (2.2%)	2 (0.4%)	0.04	0.19	0.04 – 1.00
27	Chloramphenicol	5%	5 (0.7%)	2 (0.9%)	3 (0.6%)	0.66	0.72	0.12 – 4.41
28	Mercaptobenzothiazole	2%	5 (0.7%)	1 (0.4%)	4 (0.9%)	1.0	1.97	0.22 – 17.68
29	Mercapto Mix	2%	4 (0.6%)	0	4 (0.9%)	0.31	N/A	N/A
30	Budesonide	0.01%	4 (0.6%)	1 (0.4%)	3 (0.6%)	1.0	1.47	0.15 – 14.22

Table III: Top 5 sensitizing allergens according to occupation

White collar (n=175)	Blue collar (n=121)	Pink collar (n=41)	Unemployed (n=169)	HCW (n=118)
Nickel (40%)	Nickel (37%)	Nickel (39%)	Nickel (29.6%)	Nickel (36.4%)
K dichromate (18.9%)	K dichromate (20.7%)	Fragrance I (22%)	Kathon CG (13.0%)	K dichromate (16.9%)
Kathon CG (14.3%)	Cobalt (11.6%)	MDBGN (17.1%)	K dichromate (13.0%)	Kathon CG (11.9%)
Fragrance I (13.7%)	Kathon CG (10.7%)	Kathon CG (14.6%)	Fragrance I (12.4%)	Fragrance I (11.0%)
Cobalt (8.6%)	PPD (9.9%)	K dichromate (14.6%)	Cobalt (11.8%)	BOP (7.6%)

HCW – health care worker ; K dichromate – potassium dichromate; Kathon CG - Methylchloroisothiazolinone + Methylisothiazolinone; Cobalt – Cobalt dichloride hexahydrate; BOP – balsam of Peru; PPD – paraphenylenediamine; MDBGN – methyldibromo glutoronitrile

Table IV: The most sensitizing allergens in different countries

Country		Singapore[3]	Hong Kong[9]	Thailand[4]	Singapore[23]	Hospital Selayang Malaysia[24]	Thailand[8]	Current study Malaysia
Year studied		1992-1996	1995-1999	2000-2009	2006-2011	2011	2012-2015	2011-2015
n		5810	2585	852	3177	243	206	688
Mean age in years (range)		NA*	NA†	39.1 (10-85)	38 (4-89)	NA‡	43.2 (14-84)	40.5 (18-76)
M:F	1:1.12	1:1.46	1:3.14	1:1.28	1.5:1	1:2.43	1:2.04	
Metal sensitization rate (%)	Nickel sulfate	19.4	24.4	27.6	-	-	19.4	35.3
	Potassium dichromate	3.8	4.3	20.8	-	-	6.3	16.5
	Cobalt chloride	6.6	8.7	16.0	-	-	13	10.2
Fragrance sensitization rate (%)	Fragrance mix I	6.8	13.7	18.3	-	-	10.7	12.6
	Balsam of Peru	4.7	5.7	8.5	-	-	10	7.3
	Fragrance mix II	-	-	-	-	-	-	8.7
Preservatives sensitization rate (%)	Paraben mix	-	2.0	10.8	2.58	11.8	1.9	1.3
	Formaldehyde	-	2.7	3.2	0	8.6	3.4	3.05
	Methylchloroisothiazolinone + Methylisothiazolinone	-	2.4	4.6	1.75	8.6	13.6	12.9
	Methyldibromo glutoronitrile	-	-	6.1	1.20	4.5	-	3.63
	Quaternium 15	-	1.3	1.5	1.43	2.1	1.5	1.6

NA – not available; *72.9% were aged from 21-50; †65.1% were less than 40 years old; ‡51.4% were less than 36 years old

wide range of products such as, spectacle frames, keys, coins, scissors, buttons, zippers, batteries, machinery parts, dentures, kitchenware and even orthopaedic plates. Nickel sulphate sensitisation rate was the highest in our data (35.3%), especially among the female patients. The rate was particularly higher compared to our neighbouring countries, e.g., Singapore (19.4%),[3] Thailand (19.4%)[8] and Hong Kong (24.4%)[9] as shown in Table IV. It reflects the high exposure rate to nickel in our population possibly to costume jewelleries and the lack of regulations on the concentration of nickel in costume jewelleries. Nickel sensitisation has been a global issue for decades. After the EU nickel directive in 1994 which limits the exposure to nickel through nickel containing objects, a substantial decrease in nickel sensitisation from 37% to 26% was observed among the Europe populations.[10-12] Nevertheless, nickel sulphate remains the most sensitising allergen in European countries and in North America which was reported to be around 15% and 18.5% respectively.[13-14]

Potassium dichromate is the second commonest allergen identified in our centre. Although chromium sensitisation appeared to be higher among the males (18.1%) and the blue-collar workers (20.7%), the findings were however not statistically significant. Chromium is ubiquitous in the environment and is widely used in cements, plating, leather tanning, paints, dye production, porcelain, wax, sponges, batteries, mobile phones, wood preservatives, television manufacturing, shoe polishes, tattoo ink, mascara/eye shadow pigments, etc.[15] The sensitisation rate of potassium dichromate was around 2.5% in European countries and 1.6% in North America.[13-14] EU directive restricts the marketing and use of cement containing >2 ppm chromium VI since 2005(Directive 2003/53/EC)[11] and since May 2015, leather articles placed on the markets of European countries that come into contact with the skin should not contain >3 ppm chromium VI (Comission regulation EU no 301/2014). The sensitisation rate of potassium dichromate among construction workers in European countries had reduced from

40% to 20%.[16] Our potassium dichromate sensitisation rate was again higher than our neighbouring countries, such as Singapore, Thailand, and Hong Kong (Table IV).[3,8,9,17,18] It reflects a high rate of exposure to this allergen among our patients and regulation reinforcement is needed to reduce the sensitisation rate.

Most of the sensitisation to cobalt, although common in both sexes, is considered as of unclear relevance.[12] Cobalt mono-sensitisation (without co-sensitisation with other metals) is often considered rare. Seventy patients (10.2%) in this study were found to be sensitised to cobalt chloride. Cobalt mono-sensitisation occurred in 23 patients (3.3%). Cobalt sensitisation is frequently associated with chromium sensitisation in men and nickel sensitisation in female.[11] However the differences were not statistically significant in our study. The patho-mechanism of these co-sensitisations remains unknown. Multiple different hypotheses, such as coupled exposure to both allergens, separate unrelated exposures, and a structural similarity of the haptens had been proposed but not confirmed.[19]

As expected, female patients had a higher incidence of fragrance and cosmetic sensitisations, specifically to fragrance mix I and balsam of Peru. This was similar to studies done globally. Fragrance is frequently found in perfumes, cosmetics, toiletries, many household products and even food additives. Fragrance mix I comprises of eight mixtures, each at 1%, with sorbitan sequioleate as an emulsifier in petrolatum: *Everniaprunastri*, cinnamel, cinnamyl alcohol, α-amyl cinnamyl alcohol, geraniol, hydroxycitronellal, isoeugenol, and eugenol. In general screening using Fragrance mix I alone might miss 15% of fragrance-allergic patient.[20] Fragrance mix II containshydroxyisohexyl 3-cyclohexene carboxaldehyde (HICC), citral, farnesol, citronelol, hexyl cinnamal, and coumarin. A recent study done in Thailand revealed that 17.8% of fragrance allergy was undetected when only patch testing with fragrance screening markers were performed.[21] Among those who were sensitised to fragrance mix I, only 37.9% was found to be positive to fragrance mix II, which is almost similar with the study conducted by Frosch et al.[20] As fragrance allergy becomes more common, legislations have been drawn up in an attempt to prevent further sensitisation. However, some challenges have been identified which include(i) ingredients names with numerous synonyms that are difficult to remember; (ii) only the word fragrance, but no specific fragrance substances listed in the product label; (iii) complete avoidance of fragrances is extremely difficult because they are present in occupational cleansers, industrial, food and other consumer products; (iv) Fragrance-free and "unscented" labels may be misleading because they may contain botanical or "hidden" fragrance-related ingredients used to mask odour, and to preserve and prevent infection; (v) a fragrance may be present at a concentration that is below the threshold for labelling. Isoeugenol for example in deodorants can elicit allergic reaction at concentrations below its 0.001% threshold for labelling.[22]

Preservatives are chemicals added into cosmetics, shampoos, toiletries, oral hygiene products, baby products, detergents, topical medications, and industrial products to increase the shelf life and to minimise contamination by microorganisms. In European standard series, five preservative allergens were tested, namely paraben mix, methylchloroisothiazolinone(MCI)/ methylisothiazolinone(MI) in 3:1 ratio (Kathon CG), quartenium-15, methyldibromoglutaronitrile and formaldehyde. In our cohort, MCI/MI was the most sensitising preservative with a significant higher sensitisation rate of 16.6% among the female patients. MCI/MI appears to be an emerging allergen in this region. It was noted in the top ten sensitising allergens listed in the 1990s as reported by Singapore[3] and Hong Kong.[9] Between 2006 and 2011 however, Singapore observed a sensitisation rate of 1.75% to MCI/MI[23] (Table IV). Concomitantly, Thailand reported its sensitisation rate of 4.6% between 2000 and 2009.[4] In 2011, Hospital Selayang Malaysia reported a MCI/MI sensitisation rate of 8.6%.[24] The rate soared above 10% as shown in our data and in a more recent Thailand study.[8] Although methyldibromo glutaronitrile is banned in this region, its sensitisation rate was around 4% in Malaysia. The sensitisation rate of formaldehyde among our patients was 3% and less than 2% for formaldehyde releasers (Quarternium 15, Diazolidinylurea, imidazolidinyl urea and bronopol); again similar to Thailand. Paraben mix had about 1-2% sensitisation rate in our data and Thailand, but its rate was slightly higher in Singapore. Hospital Selayang reported the highest sensitisation rate for paraben mix in 2011 which was about 11.8%.

Thimerosal, with both bacteriostatic and fungistatic effects, is widely used as ophthalmic and vaccine preservative, antitoxin, skin testing allergen, antiseptic, contact lens solution, and in cosmetic products like eye makeup. We reported a prevalence of 14%, while Singapore and Thailand reported a prevalence of 6.5%[3] and 10.62%[25] respectively. Although the sensitisation rate is high, its clinical relevance is low. Thimerosal sensitised patients are not advised to avoid vaccination, though the small risk of contact dermatitis should be pointed out.[25] Much progress had been made to date to totally eliminate or reduce the amount of thimerosal used in vaccines.[26] Miconazole cream, which is a commonly prescribed antimycotic, was found to have a high sensitisation rate i.e., 15.9% in our setting. Sensitisation should be suspected if the skin lesions evolved or worsened after using to treat superficial cutaneous fungal infections.

Sensitisations detected by the extended series were mainly from the metal, dental and cosmetic series. Stannous chloride is used for tin-plating of steel and the production of ornamental glass. It is also a food additive. Palladium chloride is used in photography, toning solutions and indelible ink. It is also used for electroplating parts of clocks and watches, and as a catalyst in metal and jewellery production. In addition, palladium chloride is present in dental alloys. However, the relevance of sensitisation to these two metal allergens in our setting remains to be discovered.

The comprehensiveness of our data is limited by the retrospective nature of the study. About 76.6% of the patients had at least one positive reaction, which appeared to be high in this region. Although there seems to be a difference in the pattern of sensitisations according to occupation, none were statistically significant. It may imply that the main source of contact allergy in the majority of our patients was not

occupational related. Nevertheless, a detailed assessment on the relevance of sensitisation with the current dermatitis was not done in all patients. Henceforward, a prospective multicentre study should be advocated to characterise the sensitisation pattern of the population in Malaysia. Nonetheless, our data does contribute as an important guide to local physicians regarding the possible allergens exposed in our patients.

In conclusion, this study provides an overview of the responsible allergens causing allergic contact dermatitis encountered in a tertiary centre in Malaysia. It is recommended that a national registry be formulated to allow better understanding of the common allergens identified in Malaysia. More efforts and regulatory measures should be made to reduce the incidence of nickel and chromate, fragrance and preservatives allergies.

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