

A study with Indian standard battery of allergens in cases of hand eczema in Rajasthan

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Abstract

Contact hypersensitivity plays an important role in initiation as well as persistence and aggravation in most cases of hand eczema. Currently patch testing is a definitive investigative tool to confirm or rule out contact hypersensitivity. A study was conducted at dermatological opd at a tertiary care clinic in Rajasthan (India). Hundred patients (59 males- 41 females) of hand eczema were tested with Indian standard series of patch testing, expanded with allergens consisting of allergens prepared from extracts of onions, garlic, soaps and detergents. The patients included were unskilled workers (53%), housewives (19%), skilled workers (10%), students and people engaged in white collar jobs – 9% by occupation. The frequent sensitizers were found to be potassium dichromate (28%), Nickel sulphate (25%), vegetables (10%), topical medicaments (7%), parthenium (6%), soap and detergents (5%), fragrance mix (4%) and paraben mix (3%). In majority of the cases substances coming in contact during occupational work were the cause of hand eczema.

Key words: Allergens, hand eczema, contact dermatitis, contact hypersensitivity, patch test

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INTRODUCTION

Inflammation of the skin may occur due to internal as well as external causes. Contact dermatitis occurs in response to a substance which comes in direct contact with skin. It may present as short term or chronic redness, itching, blistering, scaly and oozing lesions of skin, it involves a particular anatomical region of the body e.g. Hand eczema, foot eczema or disseminated eczema. Contact dermatitis can be of two type's Irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). The allergic reaction is specific to the individual and to a substance or a group of related substances called allergen, and occurs due to hypersensitivity to it, involving the

immune system. The skin rash of ACD often involves the areas in contact with the allergen e.g. hand, foot etc. and at times other areas distant from site of contact. It presents with oozing, redness, scaling, lichenification and fissuring associated with itching, it may be acute, sub-acute or chronic. ACD may appear several years after initial exposure to suspected allergens. The eczema may persist even after exposure to the allergen has been removed. Eczema adds up to 20% of all cases attending dermatology OPD, out of which a significant percentage are that of hand eczema as the hands are essential for execution of basic human needs and earning livelihood. Of late there is an increase in incidence of hand eczema leading to significant morbidity and loss of working hours. Common allergens in hand eczema may include detergents, dyes, metals, cement, cosmetics, preservatives, hair colors, industrial oils, fragrances, rubber, medicated creams and plants. At present patch testing is the only way to prove that a substance is causing ACD. Once an allergen is identified, avoiding it helps to cure or at least reduce the severity, extent and duration of eczema. Patch test may also help to differentiate ICD and ACD. Patch test has become a standard method of investigating patients with suspected cases of allergic contact dermatitis. Testing with battery

of standard series of allergens is useful when an offending agent cannot be identified inspite of careful history and clinical examination. There is wide variation in prevalence of contact hypersensitivity depending on geographical area, type of industries, occupation, socio-economic status, level of pollution and other environmental factors. The purpose of the study was to find out frequently sensitizing agents in cases of hand eczema in Rajasthan.

MATERIALS AND METHODS

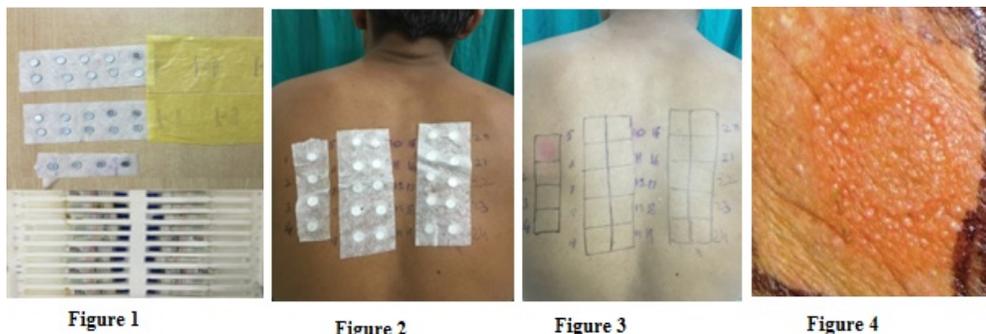
This study was a prospective open label cross-sectional study which was done at a dermatological OPD at a tertiary care hospital in Rajasthan (India). 100 patients (59 males-41 females) suffering from hand eczema were included. The inclusion criteria were age group between 10 and 60 years, both sexes, the patients suffering from hand eczema and willing to undergo patch test. The patients excluded from the study were age group less than 10 years and more than 60 years, pregnant women,

patients in acute phase of eczema, patients in whom the eczema was due to a known systemically administered agent, patients who were on corticosteroids therapy equivalent to 20mg or more of prednisolone, antihistamines, PUVA and/or any other immunosuppressive drugs for the preceding 14 days and patients having photo allergic contact dermatitis. Detailed history regarding duration, occupation, site, season, aggravating/relieving factors, nature of work, hobbies, part time activity and atopy were recorded. A carefully designed clinical record form was used. All patients were tested with 24 antigens consisting of *The Indian Standard Series (ISS)* developed by CODFI (Contact and Occupational Dermatitis Forum of India) as well as additional indigenous antigens prepared from extracts of onion, garlic, soap and detergents. Patch testing was done with Finn’s aluminium chambers. The results were read after 48 hours and 72 hours as per criteria laid down by ICDRG (International Contact Dermatitis Research Group)

Table of ICDRG

Symbol	Morphology	interpretation
-	No reaction	Negative
?	Erythema only, no infiltration	Doubtful reaction
+	Erythema, infiltration Possibly discrete papules	Weak positive Reaction
++	Erythema, infiltration, Papules, vesicles	Strong positive reaction
+++	Erythema, indiltration, confluent vesicles	Extreme positive reaction
Ir	Different types of reactions (soap effect vesicles, blister. Necrosis)	Irritant reaction
Nt		Not tested

International contact dermatitis research Group



Legend

Figure 1: Aluminum chambers and allergens; Figure 2: Patch test unit applied on upper back; Figure 3: Patch test after removal; Figure 4: Close up view

STATISTICAL ANALYSIS

Chi-square test

The Chi-Square test procedure tabulates a variable into categories and computes a chi-square statistic. This goodness-of-fit test compares the observed and expected frequencies in each category to test either that all categories contain the same proportion of values or that each category contains a user-specified proportion of values. A ‘p’ value of 0.05 proportions or less was considered to be of statistical significance.

OBSERVATIONS AND RESULTS

A total of 100 patients completed the study, of which 59 (59%) were males and 41 (41%) females. The male to female ratio was 1.44:1 Mean age was 34.96 years (Table 1 and 2).

Table 1: Distribution of HE cases according to age

Age group(years)	Number of patients	%
10-19	1	1%
20-29	23	23%
30-39	45	45%
40-49	28	28%
>50	3	3%
Total	100	100%
Mean \pm SD	34.96 \pm 8.15	
Min-max	15-60 yrs	

Table 2: Distribution of HE cases according to sex

Sex	Number of patients	%
Male	59	59%
Female	41	41%
Total	100	100%

Period of hand eczema was 6 months to more than 5 years

Table 3: Distribution of HE cases according to duration of disease

Duration	Total	Male	Female	P value
<6 Months	15	9(15.3%)	6(14.6%)	0.898
<6-12Months	20	14(23.7%)	6(14.6%)	0.060
>1-2 Years	25	15(25.4%)	10(24.4%)	0.866
>2-5Years	30	17(28.8%)	13(31.7%)	0.672
>5 Years	10	4(6.8%)	6(14.6%)	0.104
Total	100	59(100%)	41(100%)	

Occupational wise group comprised of unskilled workers (53), skilled workers (10), house wives (19), students (9), and white collar jobs (9). (Table 4)

Table 4: Distribution of HE cases according to occupation n=100

Occupation	Total	Male	Female	P value
Unskilled	53	45(76%)	8(13.55%)	<0.001
Skilled	10	7(11.86%)	3(7.31%)	<0.001
Housewives	19	0(0%)	19(46.34%)	0.190
Students	9	3(5.08%)	6(10.16%)	0.498
White collar	9	4(6.77%)	5(12.19%)	0.222
Total	100	59(100%)	41(100%)	

Patients falling into the unskilled worker group included laborers, daily wage workers, farmers, masons, industrial workers. Skilled worker group included mechanics, drivers, painters, musician, lab technicians, medical/nursing, paramedical and others. White collar workers included teachers, business persons and others. Majority of the patients included in the study were engaged were unskilled workers followed by household work. A small number (9% each) of patients were students, medical/nursing, paramedical workers, and teachers. Lesions were in the form of scaling, itching and fissuring, etc. as shown in Table (5).

Table 5: Distribution of HE cases according to morphology of lesions

Morphology of lesions	Total	Male	Female	P value
Erythema	16	6(10.2%)	10(24.4%)	0.020
Edema	2	1(1.7%)	1(2.4%)	0.713
Papules	15	2(3.4%)	13(31.7%)	<0.001
Papulovesicles	38	23(39%)	15(36.6%)	0.741
Dry scaly skin	91	56(94.9%)	35(85.4%)	0.325
Fissuring	79	49(83.1%)	30(73.2%)	0.289
Lichenification	73	43(72.9%)	30(73.2%)	0.975
Hyper pigmentation	80	50(84.7%)	30(73.2%)	0.214
Oozing	14	11(18.6%)	3(7.3%)	0.011
Nail changes	23	13(22%)	10(24.4%)	0.699

Site of involvement was palmar (40%), fingers only (29%), dorsal (16%) and whole hand (15%) (Table 6). Patient with potassium dichromate positivity had hyperkeratotic dorsal, palmar and whole hand involvement. Patients with nickel sulphate positivity presented with hyperkeratotic scaly lesions affecting palmar aspects. Vegetable dermatitis characteristically involved palmar aspects of distal phalanges of thumb, index finger, middle fingers of both hands. In some cases other fingers were also involved. Soap and detergent dermatitis mainly showed erythema, scaling and papulovesicular lesions on dorsal aspect. Topical medicaments produced lesion affecting any part of the hand depending on the site of contact.

Table 6: Distribution of HE cases according to pattern of HE

Pattern of HE	Total	Male (n=59)	Female (n=41)	P value
Palmar	40	24(40.7%)	16(39%)	0.824
Dorsal	16	9(15.3%)	7(17.1%)	0.726
Fingers only	29	13(22%)	16(39%)	0.023
Whole hand (including nails)	15	13(22%)	2(4.9%)	<0.001

Out of 100 patients, 68 patients showed positive reactions to one or more allergens.

Potassium dichromate positivity was seen in 28% patients (20 males and 8 females). Nickel sulphate sensitivity was seen in 25% patients (11 males and 14 females). Vegetable sensitivity was seen in 10 females, medicament sensitivity was seen in 7% patients (3 males and 4 females). Parthenium hypersensitivity was seen in 6% males, cobalt in 3% patients (2 males and 1 female), fragrance mix in 4% patients (1 male and 3 females), Paraben mix in 3% patients (1 male and 2 females), balsam of Peru in 2% patients (1 male and 1 female), soap and detergent in 5% females. (Table 7).

Table 7: Etiological profile of various allergens established with positive patch test

Sr. No	Allergens	Total	Male N=59		Female N=41	
			No	%	No	%
1	Potassium dichromate	28	20	33.9%	8	19.5%
2	Neomycin sulphate	3	1	1.7%	2	4.9%
3	Cobalt chloride	3	2	3.4%	1	2.4%
4	Formaldehyde	0	0	0.0%	0	0.0%
5	Benzocaine	0	0	0.0%	0	0.0%
6	4-phenylenediamine base (PPD)	0	0	0.0%	0	0.0%
7	Parabens mix	3	1	1.7%	2	4.9%
8	Nickel sulphate	25	11	18.6%	14	34.1%
9	Colophony	1	0	0.0%	1	2.4%
10	Gentamycin	1	1	1.7%	0	0.0%
11	Epoxy resin	1	1	1.7%	0	0.0%
12	Fragrance mix	4	1	1.7%	3	7.3%
13	Mercaptobenzthiazole(MBT)	0	0	0.0%	0	0.0%
14	Nitrofurazone	3	1	1.7%	2	4.9%
15	Chlorocresol	0	0	0.0%	0	0.0%
16	Wool alcohols	0	0	0.0%	0	0.0%
17	Balsam of peru	2	1	1.7%	1	2.4%
18	Thiuram mix	1	1	1.7%	0	0.0%
19	Black rubber mix	0	0	0.0%	0	0.0%
20	Parthenium hysterophorus	6	6	10.2%	0	0.0%
21	Onion (allium cepa)	6	1	1.7%	5	12.2%
22	Garlic (allium sativum)	4	0	0.0%	4	9.8%
23	Soap	3	0	0.0%	3	7.3%
24	Detergent	2	0	0.0%	2	4.9%

No positive patch test hyper sensitivity was seen with Formaldehyde, Benzocaine, 4 Phenylenediamine base (PPD) Mercaptobenzthiazole (MBT), Chlorocresol , wool alcohols , black rubber mix. The correlation of positive patch test results with occupation is shown in Table 8

Table 8: correlation of positive patch test results with occupation

Occupation	No of patients	Patch test results	
		Patients showing positive reaction	
		No	%
Housewives	19	12	63%
Unskilled workers			
Mason	18	18	100%
Laborer	7	6	40%
Farmer	6	6	100%
Industry worker	21	11	52.33%
Vegetable seller	2	-	0%
Barber	1	1	100%
Tailor	1	-	0%
Skilled workers			
Paramedical staff	7	6	40%
Mechanic	1	-	0%
Electrician	2	-	0%
Carpenter	5	3	60%
Student	5	4	80%
White collar			
Teacher	2	1	50%
Clerk	1	-	0%
Supervisor	1	-	0%
Business person	1	-	0%
Grand total	100	68	

DISCUSSION

Contact dermatitis occurs in all age groups more so in young adults with mean age 33-42 years a feature noted in many studies. It is reflection of exposure to multiple allergens in the environment.⁷our study had maximum number of patch test positivity in 30-39 age group. Out of 100 patients of suspected CD in the present series 68 showed positive patch test with one or more allergen. This is in conformity with the reports of Al Sheikh *et al* although higher than that of Zang *et al*. Our study reveal that CD was noted to single antigen 70.58%, two antigen 13.23% and more than 2 antigens in 16.22%. Patients having CD are intrinsically hyperresponsive and thus prone to develop multiple allergies as seen in various studies.^{4,3,12} Etiology of CD is quite varied and differ from place to place. Chromate was found to be positive in 28 cases. Chromate is widely distributed in cement, leather, paints, bleaching agents etc.⁶ Nickel was found to be responsible for high rate of sensitization in 25cases This may be attributed to increasing use of artificial jewelry^{4,3,12} Garlic and onion are used in almost every household. These were positive in 10 cases, all housewives. Similar incidents have been reported by Bajaj¹, Calnan⁴ and Sinha *et al*.¹¹ This response has been attributed to perennial use and sensitizing capabilities of these vegetables and also to the fact that these are held in the hands while peeling. Cobalt was another common sensitizer related to plastic,

lubricating oil, cement, detergent etc. cross sensitivity with cobalt is also seen. Nethercottet *al* and Al Sheikh *et al* found positive hypersensitivity with cobalt in 12% and 17.3% respectively. In contrastour study, only 3% patient showed positive patch test. This could be due to geographical, environmental, occupational and ethnic variations. Neomycin, Gentamycin, Nitrofurazone have become common sensitizers as seen in various studies.^{1,4,3} These observations are amply supported by our study which showed 7% positive patch test in our patients. Parthenium positivity was seen in 6% of cases. This has been found to be the most common plant allergen seen ina study by Sharma *et al*¹² in Chandigarh. Hand Eczema is multifactorial disease caused by a complex interplay of both exogenous and endogenous factors. The higher incidence of hand dermatitis is seen in the productive age group i.e. 2nd and 3rd decade indicates that it is a disorder commonly seen among economically productive age groups. The higher rates of occurrence in males shows that outdoor and unskilled workers are more prone to develop CD of hands because of exposure to cement, construction material, paint, lubricants, rubber, etc. The higher incidence among house wives, construction workers, factory workers and farmers, is due to the persistent exposure to these allergens. Approximately one-third of the patients had history of atopy which probably suggests that atopic diathesis is a predisposing factor for chronic hand dermatitis due to impaired cutaneous barrier function.

Bulk of cases in our study belonged to manual workers of lower socio-economic status, it indicates lower socio-economic status is a risk factor for hand dermatitis. Palmar involvement was more common (40%) as compare to involvement of fingers only (29%) and dorsal involvement (16%) and it depends on the type of occupation. Nail involvement, was seen in almost one fourth of the patients suggests that HE of the hands can be considered in the differential diagnosis of nail diseases. Potassium dichromate and nickel sulphate were common antigens as seen in previous studies.^{1,3} Male and female ratio showed potassium dichromate more common in males and nickel sulphate was more common in females. Our study showed hyperkeratotic eczema and patchy vesiculosquamous type of hand dermatitis was the common patterns, but clinical patterns and specific allergen association was inconclusive. A relatively high degree of positive patch test result in our study and the presence of some unexpected positive findings such as topical medicaments gave us a distinct edge in further management of these patients.

CONCLUSION

Patch testing is the most useful investigative procedure in cases of allergic contact dermatitis it helped in revealing the etiology in 68% cases of hand eczema thus proving the usefulness of patch test with Indian standard battery of allergens, in our setup addition of few suspected locally prepared antigens like soaps, detergents and vegetables further improves the usefulness of Indian standard series of allergens, somehow association between clinical patterns and the allergens was not predictable. The present study revealed that chromate (28%), Nickel (25%), vegetables (12%), Medicaments (7%), Parthenium (6%), Soap and

detergents (5%) were the most common Sensitizers in cases of hand eczema in our study.

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