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Original Article

Study of morphological patterns and identification of contact sensitizers of hand eczema by patch test

Konchok Dorjay, Premanshu Bhushan, Asok Aggarwal, Govind Srivastava, Tasleem Arif*, Mohammad Adil*

Dr. PN Behl, Skin Institute and School of Dermatology, Greater Kailash-1, New Delhi
* Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh, India

Abstract

Background Hand eczema is a common distressing condition aggravated by a number of endogenous and exogenous factors. Various morphological patterns of hand eczema have been described.

Aims To study the morphological patterns of hand eczema and identification of contact sensitizers of hand eczema by patch test.

Methods Hundred consecutive patients of hand eczema attending the outpatient department of the institute were recruited over a period of one year from 2013-2014. All the patients were patch tested using Indian standard series.

Results Pompholyx was the most common morphological pattern seen in 25% of patients followed by hyperkeratotic palmar eczema in 22%. Positive patch test to one or more allergen was present in 61% of patients. Nickel sulphate was found to be the most common allergens seen in 16%. This was followed by potassium dichromate, parthenium, fragrance mix in 11%, 8%, 8% respectively. The females (57%) were out-numbered by males (43%) with sex ratio of 1.32:1. Housewives (29%) were the most commonly affected.

Conclusion Patch testing is a very useful investigative procedure for allergic contact dermatitis (ACD) of hands. The Indian Standard Series is useful but insufficient. Hence, testing with vegetables and other personal care products are suggested especially in housewives along with Standard Series. Thus, a specific patch test series for hand eczema is suggested.

Key words
Hand eczema, patch test, morphological pattern.

Introduction

The term "hand eczema" implies to an inflammation of the skin that is confined to hands.[1-3] Hand eczema is a common and distressing condition. The point prevalence of hand eczema is around 4%, the 1-year prevalence is nearly 10%, whereas the lifetime prevalence is around 15%.[4] The incidence rate of hand eczema is estimated to be 5 cases per thousand population.[5] A high incidence rate was associated with female sex, contact allergy, atopic dermatitis, and wet work.[4] Among all eczemas, 20 to 35% affects hands.[6-8] The frequency of contact sensitization in hand eczema patients varies from 23 to 63%.[9,10] In various Indian studies, positive patch test ranges from 30% to 82% of patients with hand eczema.[11-15] Potassium dichromate & nickel are common sensitizers.[12,14-21] Hand eczema is more common among people reporting some kind of

Address for correspondence
Dr. Konchok Dorjay
Dr. P N Behl, Skin Institute and School of Dermatology, Greater Kailash-1, New Delhi
Ph: 08800946147
Email: konchokyokhang@gmail.com

occupational exposure.[22,23] Patch testing is an important test to find out the contact sensitizer in hand eczema.[12,13,15,24]

In India and Indian sub-continent, there is paucity of studies per se pertaining to morphological patterns of hand eczema and identification of contact sensitizers. This study was undertaken to assess the morphological patterns and identification of contact sensitizers in hand eczema. Hence, the present study would assume greater significance in Indian sub-continent.

Material and Methods

The study was conducted in the Skin Institute and School of Dermatology, New Delhi from 2013 to 2014. During this period, a total of 100 patients, clinically diagnosed as cases of hand eczema attending the outpatients department were recruited for this prospective observational study. An informed consent was taken from all the patients. The study was approved by the hospital ethical committee. A detailed history of each patient regarding demographic data of the patients, mode of onset, progression, duration, relation to occupation, hobbies, aggravating and relieving factors, frequency of hand washing, seasonal variation, history of atopy in patient or family, history of chronic drug intake, any drug or food allergies were recorded. Relevant investigations, routine and specific tests e.g. staining KOH and skin biopsy whenever required were carried out. The inclusion criteria were 1) patients above 18 years of age, 2) patients of both sexes and 3) clinically diagnosed cases of hand eczema. The exclusion criteria were 1) patients with eczema in other areas of the body, 2) other skin diseases like psoriasis, palmoplanter keratoderma, erythema multiforme involving the hands, 3) frank pyoderma of hand, 4) pregnant females, 5) patients on immunosuppressive drugs and 6) patients refusing consent. The morphological classification of hand eczema **(Table 1)** was done and patch testing was performed with battery of 20 allergens approved by Contact and Occupational Dermatoses Forum of India (CODFI) comprising allergens from Indian Standard Series. Readings were taken on day 2 and day 4 and interpreted according to criteria laid down by international contact dermatitis research group (ICDRG) **(Table2)**.[25] SPSS 19 software has been used for data analysis. The data were expressed in terms of Means, Standard Deviation and Proportion, followed by comparison between groups through chi-square test. A p value of less than 0.05 was considered as statistically significant.

Observation and Results

Clinically diagnosed 100 patients of hand eczema were evaluated in the present study. The mean age of the patients was 39.24±11.56 years (female 38.19±12.13 years; male 40.63±10.74 years) with maximum number of patients belonging to age group of 20 to 39 years (53%) followed by 40 to 59 years (38%). The females (57%) were outnumbered by males (43%) with sex ratio of 1.32:1 **(Table 3)**. In the age group of 20 to 39 years, females (54.39%) outnumbered the males (51.16%) but, males (44.19%) were more commonly affected than females (33.33%) in age of 40 to 59 years. The mean duration of hand eczema was 2.03±2.85 years (one month to 20 years).

Table 1 Morphological patterns of hand eczema[2]

1.	Pompholyx
2.	Hyperkeratotic eczema
3.	Finger tip eczema
4.	Discoid eczema
5.	Ring eczema
6.	Recurrent focal palmar peeling
7.	Apron eczema
8.	Chronic acral dermatitis
9.	Wear and tear dermatitis
10.	Gut eczema
11.	Patchy vesiculosquamous

Table 2 Patch test grading criteria laid down by International Contact Dermatitis Research Group (ICDRG)

-	No changes	Negative reaction
?+	Faint erythema only	Doubtful reaction
+	Palpable erythema, infiltration possibly papules	Weak positive reaction
++	Erythema, infiltration, papules, vesicular	Strong positive reaction
+++	Erythema, infiltration, oedema, coalescing vesicles/ulcerative	Extreme positive reaction
IR	No induration	Irritant reaction

Table 3 Clinico-epidemiological profile of patients

Parameters	*Female*	*Male*
Mean age	38.19±12.13 years	40.63±10.74 years
No. of patients	57	43
Mean duration of disease	1.84±2.23 years	2.28±3.51 years
History of atopy	13	8
Bilateral pattern	48	40
Unilateral pattern	9	3
Patch test positive	33	28

Table 4 Occupational profile of patients

Occupation	*Female*	*Male*	*Total*
Driver	0	4	4
Farmer	9	8	17
House maid	4	0	4
House wife	29	0	29
Lab. Technician	0	2	2
Labourer	0	14	14
Mechanic	0	2	2
Nurse	5	0	5
Rickshaw puller	0	5	5
Shopkeeper	2	4	6
Student	7	1	8
Tailor	1	1	2
Waiter	0	2	2
Total	57	43	100

Housewives were the most commonly affected (29%), followed by farmers (17%) **(Table 4)**. Among females, the most commonly affected were housewives (50.88%) and labourers formed the largest group in males (32.56%). History of atopy was present in 21% of the patients. Disease was bilateral in 88% of the patients whereas it was unilateral in 12% of the patients. Pruritus was the most common symptom which was seen in 98%, followed by scaling (83%), pain (15%), burning (5%), erythema (36%), fissuring (35%), hyperkeratotic lesion (23%), lichenification (40%), hyperpigmentation (15%), oozing (12%), papule (3%), papulovesicle (21%) and vesicle (10%).

Pompholyx was the most common morphological pattern seen in 25% of patients followed by hyperkeratotic palmar eczema (22%) **(Table 5)**. Out of 100 patients patch tested, 61 patients (61%) gave positive patch test results and 39% of patients were negative for patch test **(Table 5)**. Sensitization to single allergen was seen in 57% and to two allergens in 4% of patients. In our study, nickel sulphate was found to be the most common allergens that showed positive reaction in 16%. This was followed by potassium dichromate, parthenium, fragrance mix in 11%, 8%, 8% respectively and so on **(Table 6)**. Potassium dichromate was the most common sensitizer in males (23.26%) whereas nickel sulphate was the most common in females (21.05%). The maximum patch test positivity was found in pompholyx, which accounted for 24.59% (n=15). This was followed by hyperkeratotic palmar eczema 22.95% (n-14), patchy vesiculosquamous 11.4% (n=7), wear and tear dermatitis 11.48% (n=7), 8.20% (n=5) each in ring eczema, discoid eczema and fingertip eczema and chronic acral dermatitis 4.92% (n=3).

Table 5 Patch test positivity with morphological patterns

Morphological Pattern	*Female*	*Male*	*Total*	*Positive patch test*
Chronic acral dermatitis	1	2	3	3
Discoid eczema	7	4	11	5
Fingertip eczema	5	4	9	5
Gut eczema	0	0	0	0
Hyperkeratotic palmar eczema	10	12	22	14
Patchy vesiculosquamous	5	6	11	7
Pompholyx	15	10	25	15
Recurrent focal palmar peeling	1	1	2	0
Ring eczema	3	2	5	5
Apron eczema	0	0	0	0
Wear and tear dermatitis	10	2	12	7
Total	57	43	100	66

Table 6 Allergens positivity

Allergens	*Female*	*Male*	*Total*
Vaseline	0	0	0
Wool alchohols	0	0	0
Balsam of Peru	3	0	3
Formaldehyde	0	0	0
Mercaptobenzothiazole	2	1	3
Potassium dichromate	1	10	11
Nickel Sulphate	12	4	16
Cobalt sulphate	1	2	3
Colophony	1	1	2
Epoxy resin	0	0	0
Paraben mix	0	0	0
p-Phenylenediamine	4	2	6
Parthenium	3	5	8
Neomycin sulphate	1	1	2
Benzocaine	1	0	1
Chlorocresol	0	0	0
Fragrance mix	7	1	8
Thiuram mix	0	0	0
Nitrofurazone	0	0	0
Black rubber mix	0	2	2

Nickel sulphate (8) was the most common sensitizer in pompholyx, followed by fragrance mix (3), p-phenylenediamine (2), balsam of Peru (1), mercaptobenzothiazole (1) and parthenium (1). In hyperkeratotic palmar eczema the most common sensitizer was potassium dichromate (6) and parthenium (6). All the patients with ring eczema showed positive reaction. Out of 5 patients 4 were positive with nickel and 1 with cobalt. In chronic acral dermatitis, all showed positive reaction i.e one each with balsam of Peru, nickel sulphate and benzocaine. None of the patients with recurrent focal palmar peeling showed positive reaction.

Discussion

An increase in the incidence of hand eczema has been seen in recent years due to increased occupational exposure to multiple chemicals. The age of the patients in this study ranged from 18 to 64 years which is in accordance with study conducted by Laxmisha et al.[14] In present study, the maximum numbers of patients (53%) were in the age group of 20-39 years. Similar age group were also reported as most common presentation in various other studies.[13,15,26,27] Maximum positive reaction was also found in the same age group. In this study, the reason behind the higher prevalence of hand eczema and maximum positive reaction in the age group (20-39), can be because of the fact that this particular phase of life remains more active. Therefore, it increases the chance of exposure to allergens. The mean age was 39.24 years. Similar trend was also noted by Laxmisha et al. (39.5 years)[14] and Johansen et al. (39 years).[28]

The sex ratio of the study was 1.32:1 with females (57%) and males (43%). Female preponderance in the study is consistent with studies conducted by Huda et al. (1.75:1),[29] Bajaj et al. (1.5:1)[30], Johansen et al. (1.87:1)[28] and Diepgen et al. (1.54:1).[31] This is probably due to increased exposure of females to wet work, soap, cosmetics and detergents while washing and to vegetables during cooking.

In this study, among females maximum patients were housewives (50.88%). Our findings are similar with Kishore et al.[12] Likewise, Handa et al;[15] Charan et al;[32] Minocha et al.[33] and Sharma et al.[34] also found similar findings. In males, 67.41% were unskilled workers like farmers, labourer, rickshaw pullers and waiters. This findings are higher than Kishore et al.[12] and Sharma et al.[34] This might be due to more exposure of unskilled workers to chemicals without taking much protection for hands. Overall, housewives were the most predominant occupational group in this study, followed by farmers, labourer, and students and so on. Suman et al. found most common occupation was household worker, followed by masonry, students and others.[13]

The duration of disease varied from one month to twenty years with mean duration of 2.03 years. History of atopy was present in 21% of patients. The present findings are higher than that reported by Skoet et al. (16.4%) representing atopy as predisposing factor for hand eczema.[18] Bilateral involvement of hands was observed in 88% of patients and unilateral hand involvement was seen in 12% in this study. Pruritus (98%) was the most common symptom observed which is in accordance with study done by Goyal et al.[27] Scaling (83%) and erythema (53%) were the most frequently encountered clinical signs. This is in accordance with study done by Lerbaek A et al.[9]

The most common morphological pattern of hand eczema was pompholyx (25%). In other studies, pompholyx accounts for around 5–20% of all cases of hand eczema.[35,36] Out of 25 patients, positive reaction was seen in 15 patients representing 60% among pompholyx group and 24.59% out of all patients. It was maximum for nickel sulphate (8), followed by fragrance mix (3), p-phenylenediamine (2) balsam of peru (1), parthenium (1) and mercaptobenzothiazole (1). In a survey involving 364 patients with pompholyx, contact sensitivity has been observed in 310 patients.[37] Jain et al. found 40% sensitivity in pompholyx to one or more allergens.[38] Nickel sulphate was the most common offending allergen.[38]

Second most common pattern was hyperkeratotic palmar eczema (22%). Our finding is higher than that of Handa et al. (9%).[15] This variation may be due to the fact that most of patients in this study were labourers. Hersle et al. noted that this type of eczema is most common among middle aged man.[39] In present study 22.95% (n=14) of patients with hyperkeratotic palmar eczema showed positive reaction. It was maximum for potassium dichromate and parthenium followed by cobalt sulphate, nickel sulphate and p-phenylenediamine. Minocha et al. detected contact sensitivity in 130 out of 230 patients of hyperkeratotic palmar eczema.[33]

Fingertip eczema involves the palmar surface of the tips of some or all fingers. Fingertip eczema accounts for 9% of hand eczema with positive reaction seen in 8.20% (n=5). Tavadia et al. observed positive reaction to nickel, cobalt and fragrance.[40] Wear and tear eczema is pattern of dermatitis which affects housewives and cleaners who frequently immerse their hands in water and detergents. In this study 12 patients belong to this category in which positive reaction was noted in 7 patients representing 11.48% among all patients. Positive reaction with fragrance mix was seen in two patients, one patient each tested positive for balsum of Peru, mercaptobenzothiazole, nickel sulphate, potassium dichromate and p-phenylenediamine. In a study of housewives hand eczema by Kim et al., 37.5% showed positive patch reaction.[41]

Nummular eczema also known as discoid eczema, is a common type of endogenous

eczema. In present study, out of 100 patients 11 had discoid eczema with positive reaction in 5 patients representing 45.45% among discoid eczema. The various allergens which showed positive reaction were one each of mercaptobenzothiazole, potassium dichromate, parthenium, neomycin sulphate, fragrance mix and black rubber mix. The commonest allergens being potassium dichromate followed by nickel, cobalt and fragrance mix.[17] Khurana et al. and Fleming et al. found 50% sensitivity among nummular eczema patients.[42]

Ring eczema is characterized by a patch of eczema which develops under a ring and spreads to involve the adjacent side of the middle finger and the adjacent area of the palm. In this study 5 patients presented with ring eczema with positive reaction in all patients. Four were positive for nickel sulphate and one for cobalt sulphate. Allergic contact dermatitis under rings has been observed, from nickel, gold, and palladium.[43]

In present study, positive patch test reaction was seen in 61%. Various other studies showed positive patch test reaction ranging from 30-82%.[7,11-14,30,34] Potassium dichromate was the most common sensitizer in male and nickel sulphate was the most common sensitizer in females.

In this study, nickel sulphate (16%) was the most common sensitizer. Nickel had been the most common sensitizers in the past, perhaps due to its widespread use in jewellery, watches, bottons, zippers, rings, doorknobs, batteries, metal-cutting fluids, coins, orthopaedic plates, keys, spectacle frames and kitchenware.[44] Systemic exposure can take place from diet.[44]

Next common sensitizer was Potassium dichromate seen in 11%, which is almost in accordance with Shenoi et al. (11.3%).[45] Patients in this study had significant occupational exposure to chromates, thereby increasing the risk of contact sensitivity to chromates, which could explain the high number of positive test reactions to chromates noted by us.

Fragrance mix in this study was positive in 8% of patients which is higher than Handa S et al. (5%).[15] Most of our patients were females. Fragrance allergy occurs predominantly in women with facial or hand eczema.[46] Exposure is commonly through cosmetics, toiletries, food items and other household product.[47] Parthenium dermatitis is wide spread and distressing dermatoses in India caused by air borne allergen of compositae weed, Parthenium hysterophorus. In this study, positive reaction to parthenium was seen in 8%.

Positive reaction to p-phenylenediamine was observed in 6%. In daily life p-phenylenediamine comes in contact easily due to its use in dyes used for socks, trousers, shoes and hairs colorants. Balsam of Peru was positive in 3% which is in accordance with findings of Handa et al. (3%)[15] and Shenoi et al. (3.3%).[45] With cobalt chloride positive reaction was seen in 3%, and neomycin sulphate was positive in 2%, which is similar to Meding et al. (2%)[48] Mercaptobenzothiazole was positive in 3% which is in accordance with Handa et al. (3%)[15] and benzocaine was positive in only one patient which is same as noted by Handa et al. (1%).[15] Black rubber mix and colophony were positive in 2% each which is in accordance with study of Handa et al. (2%).[15]

None of the patients subjected to patch testing had any severe complications of patch test. No patients had a flare of dermatitis or any ulceration inspite of strong grade 3 patch test reactions.

Conclusion

Patch testing is a very useful investigative procedure for ACD of hands. There is less literature pertaining to the association between morphological pattern and allergens from India and Indian sub-continent. Therefore, large sample sizes with multicentric studies are required to establish an inclusive conclusion pertaining to the association of clinical types and allergens. The Indian Standard Series is useful but insufficient. Hence, testing with vegetables and other personal care products are suggested especially in housewives along with Standard Series. Thus, a specific patch test series for the hands eczema as in footwear series or textile series is suggested.

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