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Original Article

A study of clinico epidemiological profile and relevance of patch testing in patients with hand eczema

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Abstract

Objective To study the various morphological patterns and to identify the exogenous allergens causing hand eczema(HE) with the use of Indian standard series of patch test.

Methods This was a cross-sectional prospective study conducted over a one year period from January 2018 to January 2019 and a total of 60 patients with hand eczema aged 18years and above were included. Patch tests were applied to upper back and readings were recorded after 48hours. Data were coded and analysed at the end of study.

Results Of the 60 patients, 37 (64%) were females and 23(36%) were males. About 28 (46.7%) of them were between age group of 41 to 60 years. House wives 14 (23.3%) were most commonly affected followed by farmers 13 (21.7%). The common morphological pattern seen was chronic scaly eczema in 18 patients (30%) followed by nummular eczema in 11 patients (18.3%). Atopic history was positive in 16 (26.6%) patients. Patch test was positive in 13 (22%) patients and most common allergen found was potassium dichromate.

Conclusion Potassium dichromate was the commonest sensitizer observed in our study especially among construction workers and labourers. Patch test played a pivotal role in identifying the triggering allergens and this in turn will be helpful for the patients in avoidance of allergens thereby significantly improving the quality of life.

Key words
Patch testing, hand eczema.

Introduction

Hand eczema (HE) is a common occupational disease seen in the dermatological practice, which comprise of various spectrum of the disease, ranging from mild to severe disease with prolonged clinical course which may create negative impact on the quality of life (social and economic).[1] Hand eczema is caused by diverse etiological factors and can be classified into exogenous and endogenous types. Endogenous types include atopic dermatitis, discoid eczema, pompholyx, palmoplantar pustulosis and hyperkeratotic eczema. Exogenous types commonly seen were irritant contact dermatitis, allergic contact dermatitis and phyto photo dermatitis. Apart from this, various morphological patterns can be seen which include hyperkeratotic palmar eczema, fingertip eczema, housewives eczema, apron eczema and ring eczema.[2] Therefore, for proper management of hand eczema, identification and avoidance of the triggering contact allergens is important.

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It is difficult to differentiate clinically between allergic and irritant contact dermatitis, and the only diagnostic tool available for the identification of the allergen causing contact dermatitis is patch test.[3] In a study by Kishore *et al.*,[4] the most common sensitizer testing positive in 26% of the patients was potassium dichromate, followed by nickel in 18% of the patients. This increase in the percentage with potassium dichromate may be due to its presence in detergents and cement. Hence we conducted this study in our institute to study the various morphological patterns of hand eczema and to identify the exogenous allergens causing hand eczema with the use of Indian standard series of patch test.

Materials and methods

This study was conducted among 60 patients, newly diagnosed as HE in our outpatient department at Vinayaka Mission's Kirupananda Variyar medical college for a period of one year from January 2018 to January 2019. Our inclusion criteria were patients more than 18 years of age with hand eczema and patients who were willing for investigations. Exclusion criteria included pregnancy and lactation, patients with active eczema, patients with unrealistic expectation, immunosuppressed patients and those on long term steroids and other immunosuppressant drugs. Before starting the application process of patch test, patients were informed about test objectives, prohibition of wetting their back, prohibition of performing activities that result in excessive sweating and probable local symptoms such as itching, irritation.

Tests were applied to upper back, because of the extensive area facilitating placement of various substances. Hair were removed and skin degreased before application to prevent low adhesion of patch test. Indian standard series of patch test was used which has a set of 25 allergens. Readings were recorded after 48 hours and positive results and their intensity had been recorded in the patient's proforma and medical records. It was appropriate to wait for 15 to 20 minutes after removal of the patch to record the readings because immediately after the detachment of adhesive, the site can be erythematous and sometimes edematous due to local vasodilatation. In case of negative result, patients were advised to follow up on $5^{th}$and 7^{th} day. The scoring system described by the ICDRG (International Contact Dermatitis Research Group scoring system)[5] for patch testing was used for interpretation. Descriptive data were expressed as mean±SD. Analysis was done by student t test for quantitative data and by chi-square test for qualitative data. P value <0.05 was considered statistically significant.

Results

As far as the prevalence of HE, females outnumbered males affecting about 37 (64%) patients in our study, with male: female ratio of 1:1.6. About 28 patients (46.7 %) affected by hand eczema were in the age group of 41 to 60 years followed by 23 patients (38.3%) in the age group of 20 to 40 years. Mean age of HE among male patients was 44.47±16 years & female patients was 42±11.6, corresponding to the occupationally active group (P value =0.4916, unpaired t test). The difference was not statistically significant. The duration of the hand eczema varied from minimum 6 months to maximum two years and the mean duration of hand eczema was 6.2±10.9 months.

In our study, it was observed that HE was most commonly seen among house wives 14 (23.3%), followed by farmers 13(21.7%) and daily labourers 8 (13.3%) which included 58% of the total population. They are more prone to exposure of allergens in their daily activities.

Table 1 Distribution of HE according to occupation.

Occupation	*n=60*	*Percentage (%)*
House wife	14	23.3
Student	5	8.3
Farmer	13	21.7
Daily labourer	8	13.3
Hand loom	5	8.3
Driver	4	6.7
Petrol bunk	1	1.7
Wheat flour	1	1.7
Nurse	2	3.3
Silver merchant	1	1.7
Mechanic	4	6.7
Flower merchant	2	3.3

Table 2 Precipitating factors.

Precipitating factors	*n=60*	*Percentage (%)*
Nil	22	36.6
Sweating	11	18.3%
Stress	6	10
Cement	5	8.3
Grease ,oil	4	6.6
Wet work	4	6.6
Food items	3	5
Soap	3	5
Onions/vegetables	2	3.3

Table 3 Distribution of HE according to morphology.

Type	*n=60*	*Percentage (%)*
Hyperkeratotic eczema	9	15.0
Chronic scaly eczema	18	30
Pompholyx	7	11.7
Housewives/Dry palmar eczema	8	13.3
Fingertip eczema	4	6.7
Ring eczema	3	5.0
Discoid eczema	11	18.3

Occupation details of all patients is shown in **Table 1**. Onions, garlic, other food materials, detergents were the common aggravating factors in housewives. List of all aggravating factors associated with HE is shown in **Table 2**. Most common morphological type of HE seen in our study was chronic scaly eczema in 18 patients (30%) followed by nummular eczema in 11 patients (18.3%), house wives/ dry palmar eczema in 8 patients (13.3%) and pompholyx in 7 patients (11.7%). Distribution of various morphological types of HE is shown in **Table 3**.

Among females, it was noticed that chronic scaly eczema was the most common one seen in 9 patients(24.32%), followed by house wives eczema in 8 patients (21.62%), discoid eczema in 7(18.91%) patients and hyperkeratotic eczema in 5 patients(13.51%) constituting 78.36% of the total female patients. Among males, it was observed that chronic scaly eczema was the most common morphological type seen in 9 patients (39.13%), hyperkeratotic and discoid eczema in 4 patients each (17.39%) and pompholyx in 3 patients (13%)which included 86.91% of total male patients. Distribution of HE according to morphology among males and females is shown in **Figure 1**. Among 60 patients, patch test was positive in 13 (21.7%) patients and negative in 47 (78.3%) patients. Difference between males and females is not statistically significant. (P value=1, Fisher's exact test). Comparison of HE in males & females according to patch test is shown in **Table 4**. Among the 13 patients, 5 were males showing positive response to parthenium, potassium dichromate, black rubber mix, nickel and nitrofurazone and 8 were females showing positive response to paraphenylene diamine (PPD) 2, potassium dichromate 2, nickel 1, parthenium 1, thiuram mix 1 and fragrance mix 1. 16 patients (26.6%) had history of atopic dermatitis of which patch test was positive in 4 (25%) patients which included 3 patients with pompholyx and 1 with discoid eczema. Distribution of HE according to occupation, allergen, morphology and grading among patch test positive male and female patients is shown in **Tables 5 & 6**.

Table 4 Comparison of HE in males & females according to patch test.

Patch test	*Males*	*Females*	*Total patients*	*P value*
Positive	5	8	13 (21.7%)	1.000 (Fisher's exact test)
Negative	18	29	47 (78.3%)	
Total	23	37	60	

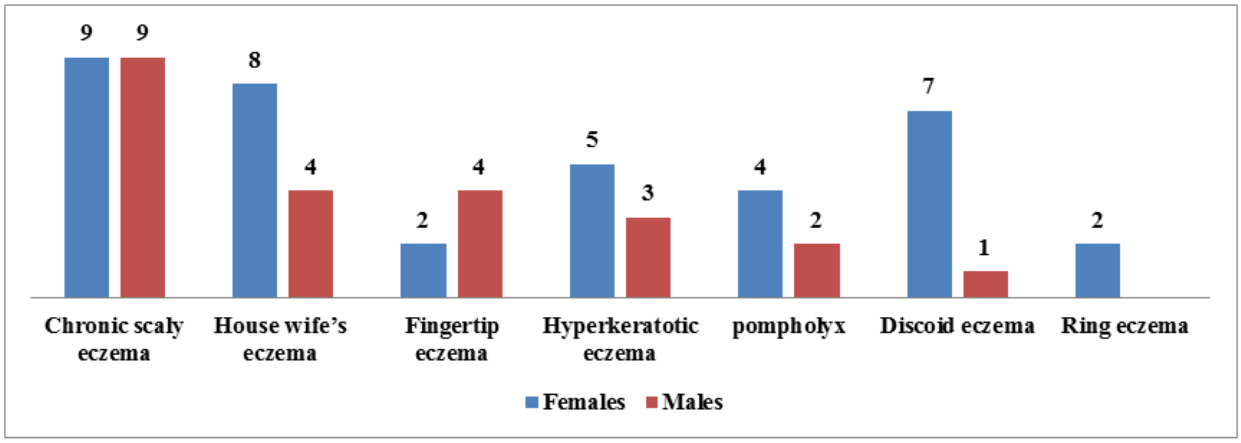

Figure 1 Distribution of HE according to morphology among males and females.

Table 5 Distribution of HE according to occupation, allergen, morphology, grading among patch test positive male patients.

S.No	*Occupation*	*Morphology*	*Allergen*	*Grading*
1	Daily labourer	Chronic scaly eczema	Potassium dichromate	2+
2	Weaving	Finger tip	Nitrofurazone	3+
3	Farmer	Hyperkeratotic	Parthenium	2+
4	Driver	Hyperkeratotic	Black rubber mix	1+
5	Mechanic	Pompholyx	Nickel	3+

Table 6 Distribution of HE according to occupation, allergen, morphology and grading among patch test positive female patients.

S.No	*Occupation*	*Morphology*	*Allergen*	*Grading*
1	Nurse	Housewives eczema	PPD	1+
2	House wife	Housewives eczema	Thiuram mix	2+
3	Construction	Chronic scaly eczema	Potassium dichromate	1+
4	Power loom	Pompholyx	Nickel	2+
5	Student	Fingertip eczema	PPD	1+
6	Construction	Discoid	Potassium dichromate	1+
7	Student	Pompholyx	Fragrance mix	2+
8	Farmer	discoid eczema	Parthenium	2+

Discussion

HE is one of the most common occupational health problem accounting for up to 9-35% of occupational health practice. HE incidence is higher among occupational groups such as house wives, hair dressers, farmers, masons, cooks, metal workers and medical/ dental specialists etc. House wives have a higher incidence due to greater contact with irritants like soaps, detergents, vegetables etc. HE is caused by diverse etiological factors which includes both exogenous and endogenous causes. Atopy is the most common endogenous cause for HE. Hand eczema has a chronic and relapsing disease. Therefore, strict efforts to avoid allergens and irritants are very important in the management of HE.[6]

Patch testing is presently the only scientific method available to detect cause of contact dermatitis. The basis of test is to elicit an inflammatory or immune response by challenging in an already sensitized person to a suspected allergen and assessing the degree of clinical response**.**

Patch test is not confirmatory and hence has to

Figure 1 Discoid eczema.

Figure 2 Pompholyx.

Figure 3 Hyper-keratotic eczema.

Figure 4 Housewives eczema.

Figure 5 Coalescing vesicles due to nickel.

Figure 6 Bullae reaction to parthenium.

be correlated with clinical history to find out the suspected allergen.[7]

Among the total 60 patients in our study, 37 were females (64%) and 23 were males (36%) and F:M ratio was 1.6:1. We observed an increased prevalence of HE in females when compared to males. These observations were similar to the studies conducted by Sharma *et al.*,[8] Ujwala priya charan *et al.* (F:M 1.09:1)[1] and Imran Majid *et al.* (F:M -1.5:1).[9] Variation of HE in sex may be due to confounding factors like occupation and increased exposure to allergens during household/occupational exposure, reflecting, particular sex is not a risk factor for the development of hand eczema.

The mean age of HE in our study was 42.7±13.5 years. HE was observed to be more common in the occupationally active age group individuals in the studies conducted by Vishwender *et al.*,[10] Handa *et al.* (38.9±25.6 years),[2] Ujwala Priya Charan *et al.* (40±10.8 years)[1] and Imran Majid *et al.*[9] which was similar to our study. The increase in incidence of HE may be due to increased exposure to allergens, minimal awareness towards protective measures against occupational exposed allergens. In our study, we observed lower percentage of involvement in older patients which may be due to the reason that these patients have a decreased exposure to allergens and energy response to contact sensitizers.

Regarding the occupation of patients with HE, 14 (23.3%) were housewives followed by 13 farmers (21.7%), 8 (13.3%) mason workers and 4 (6.7%) mechanics. This is similar to the studies conducted by Suman and Reddy,[11] Imran Majid[9] and Nataraj Vigneshkarthik *et al.*[12] This is because of the increased exposure to occupational allergens like cement, parthenium, nickel among farmers and in housewives, increase in exposure to household irritants/ allergens like detergents and vegetables like garlic and onion. In our study atopic history was found in 16 patients (26.6%) which was similar to the studies conducted by Suman and Reddy,[11] Sanjeev Handa *et al.* (43%)[2] and Ujwala Priya Charan *et al.*(23.9%).[1]

In our study it was observed that most common type of hand eczema morphology was chronic scaly eczema seen in 18 patients (30%) followed by discoid eczema in 11 patients (18.3%), hyperkeratotic eczema in 9 patients (15.0%), house wives eczema in 8 patients (13.3%) and pompholyx in 7 patients (11.7%). Discoid eczema was seen in 11 patients (18.3%) of the total population, of which only two patients were patch test positive (Parthenium & potassium dichromate). This is similar to the

study conducted by Nataraj Vignesh Karthik *et al.*[12] (Discoid eczema 28% N=59.). In our study, 7 patients (11.7%) had pompholyx. Parthenium, fragrance mix and nickel were the common sensitizers found in our study. This is almost similar to the study conducted by Sanjeev Handa *et al.*[2] which found nickel, PPD and fragrance mix as commonest sensitizers in pompholyx. Hyperkeratotic eczema was found in 9 patients (15%) of which only 2 patients had patch test positivity.

Fingertip eczema was present in 4 patients (6.7%) in our study. Patch test was positive in two patients (PPD and nitrofurazone). Wear and tear/ housewives eczema was found in 8 patients (13.3%). Housewives/ housemaids develop this variant of hand eczema due to frequent exposures to household allergens like detergents and in cumulative irritant contact dermatitis barrier function of the skin is deficient, which further enhances the penetration of the allergen. In countries like India detergents, vegetables and fruits were the common sensitizers in women. Only two patients were patch test positive (PPD and Thiuram mix). House wives were commonly affected in the recent studies by Lodha *et al.*[13] (35%) and Gupta M[14] (63.15%), which was in agreement with our study.

In total, 13 patients were positive for patch test which included three patients (23.07%) with pompholyx, two patients (15.38%) each with chronic scaly eczema**,** hyperkeratotic eczema, discoid eczema, housewives eczema and fingertip eczema. Potassium dichromate was the commonest allergen seen in the present study mainly among construction workers and labourers in accordance with the recent studies by Gupta M[14] and Hassan *et al.*[15] Among 16 patients with atopic history, 4 patients (25%) were positive for patch test. Prevalence of patch test positive to nickel and potassium dichromate in atopic dermatitis was similar to the studies conducted by Imran Majid *et al.*,[9] Chandrasekhar Laxmisha *et al.*[3] and Sanjeev Handa *et al.*[2] Patch test positivity in previous studies were variable and comparison of patch test positivity in different studies is shown in **Table 7**.

Table 7 Comparison of patch test positivity in different studies

Study name	*Patch test positive (%)*
Sanjeev Handa *et al.*[2] (N=100)	65%
Nanda B Kishore *et al.*[4] (N=50)	82%
Lakshmisha *et al.*[3] (N=36)	52.78%
Imran Majid *et al.*[9] (N=278)	48.5%
Suman& Reddy *et al.*[11] (N=100)	67%
Agarwal[16] (n=21)	30%
Nataraj vigneshkarthik[12] (N=54)	37%
Lodha *et al.*[13] (N=100)	49%
Gupta M[14] (N=30)	70%
Our study (N=60)	22%

Among 13 (21.07%) farmers, only 2 were positive for patch test in our study. Hence it is observed that although parthenium is the most common allergen responsible, other allergens should be included to increase the specificity of patch test results. In our study, 8 patients were housewives and developed hand eczema due to frequent exposures to household allergens like detergents. Inclusion of the extracts of common vegetables and fruits in the patch test series would be of immense value in identifying other allergens. Addition of atopy patch test essentially helps to identify delayed type of hypersensitivity reactions to allergens, most commonly aeroallergens and sometimes food allergens in these patients.

Two patients gave history of hair dye application and in both of them patch test was positive for PPD. Five patients (20%) were involved in occupation related to exposure to handlooms, of which only 1 patient is positive for patch test. Addition of textile series to Indian standard series may increase the specificity of patch test as suggested by Kishore NB *et al.*[4]

Limitations

The main limitation of our study is the smaller sample size and hence inclusion of larger size population studies would have definitely increased the sensitivity of patch test results. Also, we used only the Indian standard series for patch testing and the use of additional test series such as textile series, atopy series etc. would have produced more positive results.

Conclusion

Chronic scaly eczema followed by discoid eczema was the commonest morphology observed in our study. Among occupation, house wives were commonly affected followed by farmers, construction workers and labourers. Potassium dichromate was the commonest sensitizer identified by patch test especially among construction workers and labourers. Patch test therefore played a pivotal role in identifying the triggering allergens causative of HE. Identifying the suspected allergen is very important in this group of patients, as avoiding the allergen helps the patients to be free from the disease and also prevents further relapse of the disease. Proper counselling of the patients regarding allergen avoidance also helps in improving the psychological status of the patient thereby significantly improving the quality of life.

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