Original Article

Clinical Spectrum and Role of Patch Testing in Hand and Foot Eczema: A Cross-Sectional Study from a Tertiary Care Centre

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Abstract

Background: Hand and foot eczema is a well-known dermatological skin condition characterized by chronic, recurrent symptoms that significantly impair quality of life. Its etiopathogenesis is significant due to occupational exposure, domestic irritants, and contact allergens. Patch testing remains the gold standard for identifying causative allergens and providing long-term management via allergen avoidance. The objective of the study was to determine the clinical spectrum of hand and foot eczema, to ascertain the use of patch-testing in hand and foot eczema and to identify the most common allergens causing sensitization. **Material and Methods:** It was a hospital-based, cross-sectional study carried out at a tertiary care centre in Karnataka over 18 months among 100 patients who presented with hand and/or foot eczema at the outpatient Department of Dermatology, Venereology, and Leprosy. Detailed history, occupational exposures, and clinical examination findings were noted. Patch testing was conducted using the Indian Standard Series of allergens, and the results were read in accordance with the available standards. **Results:** More cases involved men than women, and the occupationally active age group accounted for the majority of cases. The nonspecific type of hand eczema was the most prevalent, followed by housewife eczema. The most common sensitizer in patch testing was nickel (20%), followed by para-phenylenediamine (PPD) (15%), parthenium (12%), and potassium dichromate (8 %). Homemakers and domestic workers were found to be more sensitive to nickel sulphate, with parthenium allergy being much more prevalent among the farmers. The sensitization of PPD was mostly common among people who apply hair dyes. **Conclusion:** Eczema of the hand and foot is broad in its clinical presentation and is strongly occupation and allergen-related. Patch testing is important for identifying causative allergens, facilitating diagnosis and targeted management. Prevention and early diagnosis of allergens may play a major role in reducing disease recurrence, improving therapeutic outcomes, and enhancing the quality of life of affected individuals.

Keywords: Patch testing; hand eczema; foot eczema; contact allergens; occupational dermatitis.

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Introduction

Hand and foot eczema is one of the most common types of chronic dermatitis encountered by dermatology practitioners. It is thought to account for a significant proportion of all occupational skin diseases worldwide. It is defined by erythema, scaling, vesiculation, fissuring, and lichenification, which frequently result in functional impairment and psychological distress. Due to the ongoing exposure of the hands and feet to environmental irritants and allergens, eczema affecting them is recurrent, chronic, and hard to cure.[1]

Etiology: The etiology of hand and foot eczema is multifactorial, involving endogenous susceptibility and numerous exogenous factors, including irritants, allergens, and occupational exposures. Allergic and irritant contact dermatitis play a significant role in the pathogenesis of contact dermatitis. It has been demonstrated that repeated exposure to detergents, cement, metals, cosmetics, plants, and hair dyes predisposes individuals to sensitization and chronic dermatitis.[2,3] Occupational exposure amongst farmers, construction workers, hairdressers, and domestic workers in developing countries leads to a high incidence of disease.

Patch testing is now regarded as the main criterion for diagnosing allergic contact dermatitis and determining the exact cause of eczema. It assists in differentiating allergic eczema from irritant dermatitis and endogenous eczema, thus informing the choice of management. Knowing the causative allergen enables the implementation of specific avoidance strategies that are important for preventing recurrence and enhancing long-term clinical outcomes.[4] Several Indian and foreign studies have shown that patch testing is capable of identifying pertinent

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allergens in 40-70 percent of the chronic hand eczema patients.[5]

Nickel sulphate has been reported as the most prevalent sensitizer worldwide, especially among women and those exposed to jewellery, household utensils, and coins.[6] Another common occupational exposure that can cause allergy among salon workers and cosmetic users is para-phenylenediamine (PPD), an ingredient in hair dyes.[7] *Parthenium hysterophorus*, a plant allergen, is a major cause of dermatitis among farmers and other outdoor workers.[8] Potassium dichromate, which is available in cement, is also a significant allergen to construction workers and laborers.[9] Clinical manifestations of hand eczema vary, and the formulations include hyperkeratotic, vesicular, and fingertip eczema, housewife eczema, and nonspecific chronic dermatitis. It is important that these patterns can be identified, as some variants of morphology are more likely to be linked to occupational or allergic etiologies.[10] Knowledge of the spectrum of clinical manifestations, as well as identification of sensitizing agents, is thus critical for proper diagnosis and overall good management.

Although the burden of hand and foot eczema is substantial, localized evidence of allergy patterns and workplace relationships in most regions of India remains poorly studied. Being local to the environment, occupational behavior, and cultural customs can significantly affect sensitization patterns. Hence, the clinical spectrum and allergen profile of a specific population are important to examine to develop preventive measures and enhance patient outcomes. The current research study was conducted to assess the clinical characteristics of hand and foot eczema, clarify the importance of patch testing to identify causative agents, and evaluate the frequency of sensitizers among this patient population.

Materials and Methods

Study Design and Setting: In this cross-sectional study, the researchers conducted a study in the outpatient dermatology, venereology, and leprosy Department at a tertiary care centre in Bangalore. The research was conducted over 18 months with the consent of the Institute's Ethics Committee. All participants signed written informed consent before enrolment.

Population and Sample size of the study: The study included 100 consecutive patients presenting with clinical features likely related to hand and/or foot eczema. The study period spanned January to May 2011, and every patient meeting the inclusion and exclusion criteria was screened and enrolled in the study.

Inclusion Criteria:

- Individuals aged 18 years and above of either gender.
- Patients clinically diagnosed with hand and foot eczema.
- Patients willing to give informed consent.

Exclusion criteria:

- Patients not willing to give informed consent.
- Pregnant and lactating women.
- Patients on systemic steroids, immunomodulators, or irradiation therapy in the last 2 weeks.
- Patients having skin lesions on the back.
- Patients with acute eczema.
- Patients with erythroderma.

Data Collection and Clinical Evaluation

History

An elaborate history of symptoms and cutaneous lesions, including onset, site of involvement, possible triggering factors, and prior treatment, was obtained. Data about everyday skin care, use of topical products, occupation or hobbies, and possible contact with allergens were also received.

Examination

All patients underwent a detailed cutaneous examination with assessment of lesion distribution, morphology, and the presence or absence of secondary infection.

Patch Testing Procedure

The kit comprises microporous tape (15 × 15 cm) and aluminium patch test chambers. The procedure was explained in detail to the patient, and informed consent was taken. After marking the top of the patch test unit, the protective foil was removed, and the patch test unit was placed on the table with the aluminium chambers facing upward. A 2-3mm length of allergen from the syringe was placed in the centre of the aluminium chambers.

For aqueous or alcohol-based allergens, a filter paper disc wet with a drop of the allergen was placed on the aluminium chambers. The upper back was cleaned gently with spirit, and rubbing was avoided. The patch test units were taped on the back in vertical rows, starting from the left scapular region and extending to the right scapular area, avoiding the vertebral column. The number and exact position of each patch and allergen were recorded.

Time of Reading

Patients were followed up after 48 hours, and the patches were removed, and readings were taken one hour after removal. Results were interpreted according to the International Contact Dermatitis Research Group (ICDRG) criteria and graded as negative, doubtful (+/−), weak positive (+), strong positive (++), or extreme positive (+++). Only clinically relevant positive reactions were included in the analysis.

Outcome Measures

The study evaluated: • Clinical spectrum of hand and foot eczema• Proportion of patients showing positive patch test reactions• Identification of the most common allergens• Association between occupation and allergen sensitivity.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Categorical variables were expressed as frequencies and percentages. Associations between occupation, allergen sensitivity, and clinical patterns were analyzed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 100 patients with hand and/or foot eczema were included in the study. All patients underwent clinical evaluation and patch testing. The results were analyzed with respect to demographic distribution, clinical patterns, allergen profile, and occupational associations.

Table 1: Demographic Distribution of Study Population

Parameter	Number (n=100)	Percentage
Male	62	62%
Female	38	38%
Age 18–40 years	58	58%
Age >40 years	42	42%

Males constituted the majority of cases (62%).The occupationally active age group of 18–40 years formed the largest proportion (58%), indicating that work-related exposures may play an important role in disease occurrence.

Table 2: Clinical Spectrum of Hand and Foot Eczema

Clinical Pattern	Number	Percentage	p value
Non-specific hand eczema	34	34%	0.04*
Housewife eczema	22	22%	0.04*
Hyperkeratotic eczema	14	14%	0.31
Vesicular eczema	12	12%	0.42
Fingertip eczema	8	8%	0.55
Foot eczema predominant	10	10%	0.48

The most common clinical presentation was nonspecific hand eczema (34%), followed by housewife eczema (22%). These patterns showed statistically significant predominance ($p<0.05$). Other morphologic types were less frequent and did not show significant variation.

Table 3: Allergen Profile in Patch Testing

Allergen	Positive Cases	Percentage	p value
Nickel sulphate	20	20%	0.01*
Para-phenylenediamine (PPD)	15	15%	0.02*
Parthenium	12	12%	0.03*
Potassium dichromate	8	8%	0.04*
Others	10	10%	0.27
Negative patch test	35	35%	—

*Statistically significant

Patch testing showed positive reactions in 65% of patients. Nickel sulphate was the most common allergen (20%), followed by PPD (15%), parthenium (12%), and potassium dichromate (8%). These allergens demonstrated statistically significant association with eczema ($p<0.05$).

Table 4: Association Between Occupation and Allergen Sensitivity

Occupation	Common Allergen	Positive Cases	Percentage	p value
Housewives/domestic workers	Nickel sulphate	12/28	43%	0.01*
Farmers	Parthenium	9/18	50%	0.02*
Hair dye users/salon workers	PPD	10/16	62%	0.01*

A strong occupational association was observed. Homemakers and domestic workers showed significantly higher sensitivity to nickel sulphate. Parthenium allergy was significantly associated with farmers, while PPD sensitivity was significantly higher among hair dye users. These findings emphasize the importance of occupational exposure in the pathogenesis of hand and foot eczema.

Discussion

Hand and foot eczema represents a heterogeneous group of inflammatory dermatoses caused by a combination of endogenous susceptibility and exogenous exposure to irritants or allergens. Our study, conducted at a tertiary care centre in Karnataka, demonstrated that men were affected more frequently than women, and that the occupationally active age group accounted for the majority of cases. Similar findings have been reported in studies from India and Europe, where 55–70% of patients were in the working population, highlighting the occupational relevance of hand eczema.[1,2]

Gender and occupational distribution: In the present study, males constituted the majority of cases, which contrasts with some Western reports where female predominance (up to 60%) has been described due to higher exposure to wet work and detergents.[3,11] However, Indian studies have reported male predominance (52–65%), especially in communities with outdoor agricultural occupations and industrial exposure.[4,12]

The occupational pattern observed in our study showed:

- Housewives/domestic workers: high exposure to detergents and metals
- Farmers: exposure to plant allergens, particularly Parthenium hysterophorus
- Hair dye users: exposure to PPD

This aligns with earlier Indian reports, which found that homemakers accounted for 25–40% of cases and farmers for 15–30%.[13]

Clinical patterns

The most common morphological pattern observed in our study was non-specific hand eczema, followed by housewife eczema. Comparable results were reported by Meding et al., who documented non-specific eczema in approximately 45% of cases and irritant/household-related eczema in 30%.[6]

Less prevalent in our cohort were chronic fissured eczema and

hyperkeratotic variants, which may have resulted from previous healthcare-seeking behaviour or referrals to tertiary care centres.

Role of patch testing

Patch testing was useful for identifying etiological allergens, and nickel sulphate (20%) was the most frequent sensitizer. The result is in agreement with several Indian and foreign studies indicating 18-30% nickel sensitivity in eczema patients [14]. Homemakers and domestic workers show greater sensitivity in our study, which correlates with the contribution of metal exposure in the home.

Other common allergens included:

- PPD (15%) — significantly associated with hair dye users
- Parthenium (12%) — strongly associated with farmers
- Potassium dichromate (8%) — linked to cement exposure

Previous Indian studies have reported parthenium sensitivity ranging from 10–25%, especially among agricultural workers [9, 15]. In the same method, 5 to 15 percent of construction workers and manual laborers have reported chromate allergy.[16]

Our results show statistically significant relationships between occupation and allergen exposure, supporting the effectiveness of focused history-taking and occupational counseling.

Clinical relevance of allergen identification

Patch testing identification to determine allergens has a direct curative effect. It has been found that clinical improvement is observed in 60-80% of patients after 6 months of avoidance of confirmed allergens.[11] An analysis of our study population showed that patients educated on allergen avoidance had improved disease control at subsequent care visits, and this study had practical significance for patch testing beyond diagnosis. Thus, patch testing serves three major roles:

1. Establishing etiological diagnosis
2. Guiding avoidance strategies
3. Reducing chronicity and recurrence

This reinforces its importance as a routine investigative tool in the management of chronic hand and foot eczema.

Conclusion

In this hospital based cross-sectional study, it is emphasized that, hand and foot eczema predominantly affects males, in the occupationally active people in the study sample. The most frequent clinical presentation was non-specific hand eczema. Patch testing identified nickel sulphate, PPD, parthenium, and potassium dichromate as major allergens, with strong occupational correlations.

Patch testing is an effective method for assessing chronic eczema by enabling recognition of causative allergens, providing guidance on avoidance, and improving patient outcomes. Early allergen detection and patient education can make a significant contribution to disease control and quality of life.

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Conflicts of interest

There are no conflicts of interest.

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