

A Descriptive Study on Socio-Demographic Characteristics and Identification of Allergens by Means of Patch Testing in Patients with Hand and Foot Eczema in a Tertiary Care Hospital

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ABSTRACT

Introduction: Eczema of hands and feet is one of the commonest problems with enormous socio economic consequences and a massive impact on patient's quality of life. The complex and industrialized environment, has made it important to find the exact aetiology of the disease and to use appropriate preventive measures.

Objectives: 1. To determine the Socio-demographic characteristics of patients with Hand and foot eczema. 2. To identify the allergens most commonly involved in Hand eczema, foot eczema and hand and foot eczema by means of patch testing.

Material and methods: A descriptive study was done in 100 hand and foot eczema patients, attending teaching hospital from May 2019 to September 2019. After obtaining institutional ethical committee clearance and informed consent from patients, data was collected on Socio demographic details, history on eczema, systemic illnesses, pre-existing skin disease, predisposing factors, genetic, seasonal factors, hobbies, cosmetics, personal objects and details of topical and systemic medications. Data entered in Microsoft excel 2007 Chi-square test was used with $P < 0.05$ as statistically significant.

Results: Majority of the cases were hand eczema (47%) followed by foot (36%) and hand and foot eczema (17%). The commonest age group affected was 19-40 yrs (48%) which was statistically significant. Maximum number of positive reactions in hand and both hand and foot eczema was seen to potassium bichromate and in isolated foot involvement to Parthenium.

Conclusion: Patch testing kit of Indian standard series is an excellent method of finding the possible allergen; it needs further modification and inclusion of other antigens in order to yield higher positivity and better management of dermatitis.

Keywords: Hand and Foot Eczema, Determinants, Patch Test.

INTRODUCTION

Eczema, a term derived from the Greek word meaning 'to boil', is a clinical and histological pattern of inflammation of the skin seen in a variety of dermatoses with diverse aetiologies.¹ The terms "dermatitis" and "eczema" are often used synonymously. The term "eczema of hand and foot" refers to predominant involvement of hands or feet or both in the eczematous process.²

Eczema of hands and feet is one of the commonest problems encountered in dermatology practice. An estimated 2-10%

of population is likely to develop hand eczema at some point of time during life. 20-35% of all dermatitis affects the hands. It is the most common occupational skin disease, compromising 9-35% of all occupational disease and up to 80% or more of all occupational contact dermatitis.⁴ The incidence of hand eczema was found to be 10.9-15.8% in various studies.⁵ In India, 5-10% of the patients attending dermatology outpatient department were affected by allergic contact dermatitis and two thirds of these cases had hand involvement.^{5,6} In most surveys, females were more commonly affected than males.

Due to the high incidence and prevalence of hand and foot eczema, it has enormous socio economic consequences and a massive impact on patients quality of life. The increasingly complex and industrialized environment of 21st century, has made it all the more important to find the exact aetiology of the disease and to use appropriate preventive measures.⁷

Objectives:

1. To determine the Socio- demographic characteristics of patients with Hand and foot eczema.
2. To identify the allergens most commonly involved in Hand eczema, foot eczema and hand and foot eczema by means of patch testing.

MATERIAL AND METHODS

A descriptive study was done in patients with clinically diagnosed hand and foot eczema, attending the outpatient department of teaching hospital from May 2019 to September 2019.

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Inclusion criteria

Patients of all ages of either sex with clinical diagnosis of hand and foot eczema. Patients who are willing to participate in the study, to undergo patch test and to come regularly for follow up were included in the study.

Exclusion criteria Patients with acute dermatitis, Pregnant women, Patients on corticosteroids (> 3weeks), Patients on immunosuppressive agents for other diseases were excluded. Patients were selected by purposive sampling method. Sample size was calculated using formula for finite population. Where, Z is the standard normal deviate, 1.96 at 95% confidence interval.

As per study by Akansha et al Eczema cases form almost 20% of all cases attending dermatology OPD. ⁸

Hence $P = \text{Prevalence}$ is 20%. i.e $P = 0.2$, $1-P = (1-0.2)$

$e = \text{allowable error}$ was 4% (i.e 4% of prevalence was considered)

$N = \text{study population}$ (Patients with Hand and foot eczema who attended dermatology OPD in the institution in the previous year during the April 2018 to September 2018) = 120,

$$\text{Sample size}(n) = \frac{\frac{(z^2 X p(1-p))}{e^2}}{1 + \frac{(z^2 X p(1-p))}{(e^2 N)}}$$

$$\text{Sample size}(n) = \frac{\frac{(1.96)^2 X 0.2(1-0.2)}{(0.04)^2}}{1 + \frac{1(1.96)^2 X 0.02(1-0.02)}{(0.04)^2 \cdot 120}}$$

Corrected sample size (with non response rate and loss to follow up as 10%) was $91+9 = 100$.

After obtaining institutional ethical committee clearance and informed consent from patients. Data was collected on Socio demographic details (Socio economic status as per BG Prasad classification)⁹, history of onset, duration and evolution of symptoms, systemic illnesses, pre-existing skin disease, predisposing factors, genetic, seasonal factors, hobbies, cosmetics, personal objects and details of topical and systemic medications.

Clinical examination and Routine investigations was done. All the 100 cases were patch tested with Indian standard series obtained from Systopic labs, New Delhi. The kit consists total of 20 antigens including Vaseline as control and plant antigens. Positive patch test was interpreted according to ICDRG recommendations.

The list of antigens used - indian standard battery

1. Vaseline - control
2. Wool alcohol (lanolin) - 30% in petrolatum vehicle
3. Peru balsam - 10 % in petrolatum vehicle
4. Formaldehyde - 2% in aqueous vehicle
5. Mercaptobenzothiazole - 1% in petrolatum vehicle
6. Potassium bichromate - 0.1% in petrolatum vehicle
7. Nickel sulphate - 5% in aqueous vehicle

8. Cobalt sulphate – 5% in aqueous vehicle
9. Colophony – 10% in petrolatum vehicle
10. Epoxy resin – 1% in petrolatum vehicle
11. Parabens mix – 9% in petrolatum vehicle
12. Paraphenylenediamine -1% in petrolatum vehicle
13. Parthenium – 15% in petrolatum vehicle
14. Neomycin sulphate – 20% in petrolatum vehicle
15. Benzocaine - 5% in petrolatum vehicle
16. Chlorocresol – 1% in petrolatum vehicle
17. Fragrance mix – 8% in petrolatum vehicle
18. Thiuram mix -1% in petrolatum vehicle
19. Nitrofurazone – 1% in petrolatum vehicle
20. Black rubber mix – 0.6% in petrolatum vehicle

Method of application of the patches: Under aseptic precautions, Patches were applied in vertical rows on both halves of the upper back, avoiding the spinal region. The number and location of patches with names of allergens were recorded. Patients were instructed not to take bath, avoid tight underclothes, exercise, rubbing, scratching and lying on the back and report immediately if there is severe itching or irritation. Also to come after 48 hours and 96 hours for patch test reading.

Reading

All the patches were removed on day 2, reading was taken after half an hour and again on day 4. Readings were interpreted according to ICDRG recommendations.

?+ Doubtful reaction; faint erythema only

+ Weak positive reaction; palpable erythema, infiltration, possibly papules.

++ Strong positive reaction; erythema, infiltration, papules, vesicles.

+++ Extreme positive reaction; intense erythema, infiltration and coalescing vesicles. ¹⁰

Statistical analysis: Data entered in Microsoft excel 2007 and represented in tables and graphs. Chi-square test was used for statistical analysis of categorical variables with $P < 0.05$ as statistically significant.

RESULTS

In the present study, on examination Majority of the cases were hand eczema accounting for 47 % followed by foot 36% and finally hand and foot eczema accounting for 17 %. Out of 100 patients, 60 (60%) were males and 40 (40%) were females with a male to female ratio of 3:2. The commonest age group affected was 19-40 yrs constituting 48% which was statistically significant. Majority of the patients were unskilled workers (farmers, construction workers, cleaner, sweeper, peon, watchman, masons, vendors, mechanics, carpenters, domestic helpers) accounting for 48% followed by housewives (22%) followed by skilled workers (nurse, pharmacists, tailors, drivers) (16%) and finally students (14%). In the present study, majority of the patients were of Upper middle socio economic class accounting for about 46% (males 46, females 27) followed by middle class (27%) and there were no patients from lower socio economic class. Though proportion of males, unskilled workers and patients

Socio-demographic variable	Groups	Hand eczema (47)	Foot eczema (36)	Hand and foot eczema (17)	Total (100)	X ² / p value
Age	<18 years	4 (8.5%)	10 (27.8%)	6(35.3%)	20 (20%)	14.8827/0.004951.
	19-40 years	23(48.9%)	21(58.3%)	4(23.5%)	48 (48%)	
	41-70 years	20(42.5%)	5(13.9%)	7(41.2%)	32(32%)	
Gender	Male	29 (61.7%)	19(52.8%)	12(70.6%)	60 (60%)	1.6333/ 0.441918.
	Female	18 (38.3%)	17 (47.2%)	5 (29.4%)	40(40%)	
Occupation	Skilled	10 (21.3%)	5 (13.9%)	1(5.9%)	16(16%)	11.5155/0.073691.
	Unskilled	15 (31.9%)	20 (55.5%)	13(76.5%)	48(48%)	
	Housewives	14 (29.8%)	6 (16.7%)	2(11.8%)	22(22%)	
	Students	8 (17%)	5 (13.9%)	1(5.9%)	14(14%)	
Socioeconomic status	Upper Class I	5(10.6%)	7(19.4%)	2(11.8%)	14(14%)	4.8798/0.559324.
	Upper middle Class II	25(53.2%)	16(44.4%)	5(29.4%)	46(46%)	
	MiddleClass III	12(25.5%)	8(22.2%)	7(41.2%)	27(27%)	
	Lower Middle class IV	5(10.6%)	5(13.9%)	3(17.6%)	13(13%)	

Table-1: Distribution by socio-demographic data versus site of eczema

	Groups	Hand eczema (47)	Foot eczema (36)	Hand and foot eczema (17)	Total (100)
Complaints of the patient	Itching	44 (93.6%)	35 (97.2%)	17(100%)	96(96%)
	Pain	26 (55.3%)	15(41.7%)	7(41.2%)	48(48%)
	Burning sensation	5(10.6%)	3(8.3%)	2(11.8%)	10(10%)
Duration of the symptoms	Up to 6 months	26 (55.3%)	14(38.9%)	11(64.7%)	51(51%)
	6 months- 1 year	8(17%)	8(22.2%)	3(17.6%)	19(19%)
	1-5years	6(12.8%)	10(27.8%)	2(11.8%)	18(18%)
	>5 years	7(58.3%)	4(11.1%)	1(5.9%)	12(12%)
Atopy	Present	1 (2.1%)	2(5.6%)	1(5.9%)	4(4%)
	Absent	46(97.9%)	34(94.4%)	16(94.1%)	96(96%)
Patch test	Positive	26(55.3%)	9(25%)	7(41.1%)	42(42%)
	Negative	21(44.7%)	27(75%)	10(58.8%)	58(58%)

Table-2: Distribution by sites versus characteristics of the disease, atopy and patch test

Allergen	hand	%	foot	%	Hand & foot	%	total
Potassium bichromate	13	61.9%	3	14.2%	5	23.8%	21
Parthenium	7	46.6%	6	40%	2	13.3%	15
BRM	3	50%	2	33.3%	1	16.6%	6
Nickel sulphate	5	100%	0	0%	0	0%	5
Colophony	2	66.6%	0	0%	1	33.3%	3
Peru balsam	2	100%	0	0%	0	0%	2
Cobalt sulphate	1	50%	1	50%	0	0%	2
Parabens mix	1	50%	1	50%	0	0%	2
PPD	2	100%	0	0%	0	0%	2
Fragrance mix	2	100%	0	0%	0	0%	2
Formaldehyde	1	100%	0	0%	0	0%	1
MCBT	0	0%	0	0%	1	100%	1
Epoxy resin	0	0%	1	100%	0	0%	1
Neomycin sulphate	1	100%	0	0%	0	0%	1
Chlorocresol	1	100%	0	0%	0	0%	1
Thiuram mix	1	100%	0	0%	0	0%	1

Table-3: Positive patch test reactions of allergens in different sites

belonging to upper middle class were most commonly affected it was not significant statistically (shown in table 1). Patients had multiple complaints. Majority of the patients complained of itching (96%) followed by pain (48%) and

burning sensation (8%). Duration of the symptoms varied from 2 weeks to 20 yrs. Majority of the patients presented within 6 months of onset of the symptoms (51%). Only 4% were found to have atopic history. Majority of the patients

No of allergens	Male	%	Female	%	Total
1	14	58%	10	42%	24
2	9	64%	5	36%	14
3	2	67%	1	33%	3
>3	0	0%	1	100%	1

Table-4: Distribution by Sensitivity to allergens – single/multiple

Grading	No of reactions	%
Doubtful (? /+)	13	13%
1+	49	49%
2+	3	3%
3+	1	1%

Table-5: Distribution by Grading of positive reactions

(96%) were non atopic. Percentage of positive reactions in hand dermatitis was 55.3% followed by hand and foot dermatitis with 41.1% and least percentage of positive cases was seen in isolated foot dermatitis (25%) (Shown in table 2) Scaling(64%) was the most common morphology followed by hyper pigmentation(40%), lichenification (33%), oozing

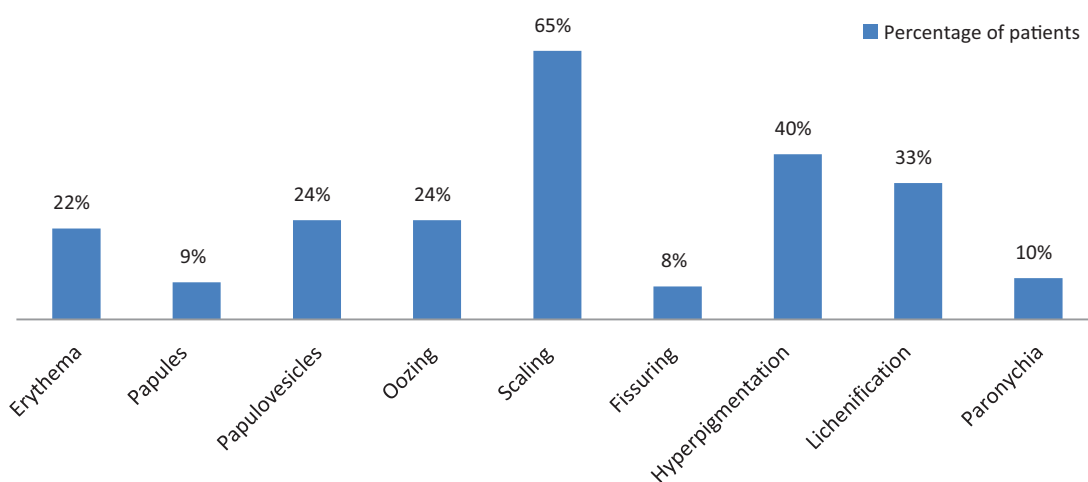


Figure-1: Distribution of study participants by Morphology of the lesions

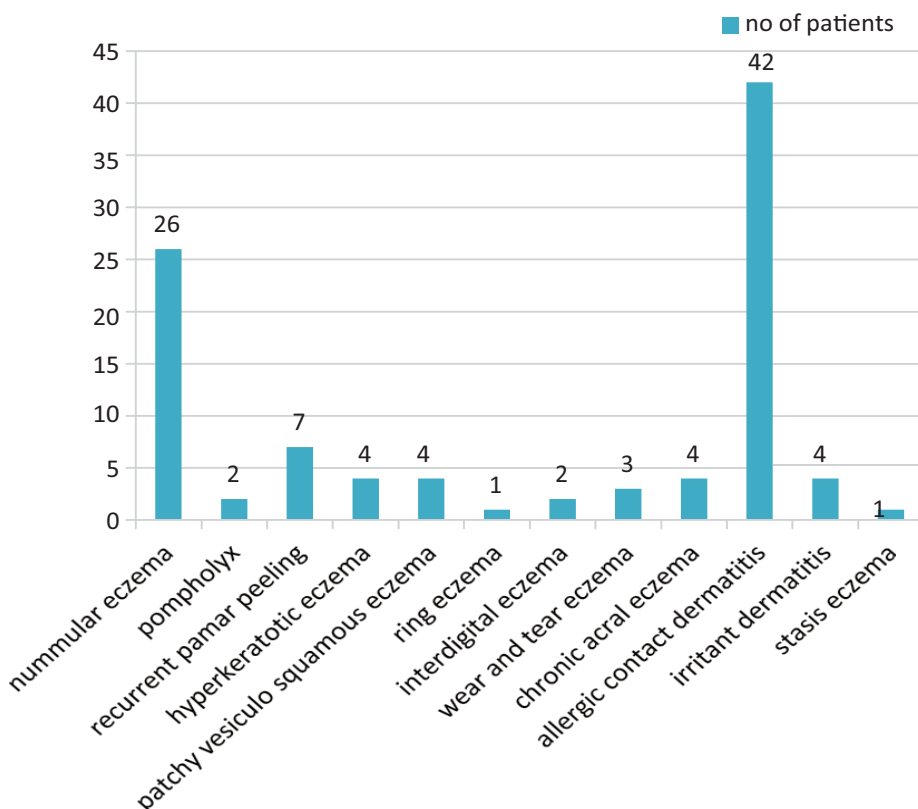


Figure-2: Frequency of distribution of various types of eczema

and papulovesicles (24%) each, erythema 22%, paronychia 10% papules 9% and fissuring 8% (figure 1).

Allergic contact dermatitis (42%) was the most commonly encountered type followed by nummular eczema (26%) followed by recurrent focal palmar peeling (7%), patchy vesiculo squamous eczema, hyperkeratotic eczema and chronic acral eczema 4% each, wear and tear eczema 3%, pompholyx and interdigital eczema 2% each, ring eczema and status eczema 1 % each (figure 2).

Maximum number of positive reactions in hand and both hand and foot seen to potassium bichromate and in isolated foot involvement maximum positive reactions are seen to Parthenium .

In the present study majority of the reactions were to single antigen (57%) followed by 2 antigens (33.3%) followed by 3 antigens (7%) and only one reaction is noted to >3 allergens (2%).

In this study, total of 66 positive reactions were seen of which 49 reactions were graded as + (49%), 3 reactions were graded as ++ (2%), 1 reaction was +++ (1%) and doubtful reactions (13%).

DISCUSSION

Hand and foot eczema is one of the commonest dermatological conditions encountered in day to day clinical practice. Hand and foot eczema may result in considerable physical and occupational morbidity, besides causing significant psychosocial embarrassment. The condition presents with varied clinical features.

The only long lasting and effective solution for this malady is to identify the causative agent and its avoidance. Though patch test is considered to be the diagnostic test for the identification of the allergen, it is often underutilized.

In the present study majority of the patients (75%) were in the age group of 19-40 years (48%). This is similar to study by Handa et al (54%) where the most common age group was between 21-40 years.¹¹ This is possibly because of the fact that this age group is the active phase of one's life where chances of exposure to various irritant and allergens in the environment are more.

In the present study males were found to be predominantly affected by hand and feet dermatitis with male to female ratio being 3:2. A similar male preponderance was by Handa et al (2:1), by Sharma and Kaur (1.66:1), Kishore et al (1.21:1).^{11,4,12} This may be due to the fact that males are exposed more to environment as they work outdoors.

In the present study majority of the patients affected belonged to unskilled workers (construction workers, agricultural labourers, masons sweeper, watchman, cleaner, gardener, compounder, domestic helper) 48% which is similar to study by Kishore et al (53.6%) and study by Sharma and Kaur (40.42%).^{11,12} This may be due to unskilled workers are exposed to various chemicals, irritants, allergens without adequate or no protection.

In the present study itching (96%) was the most common complaint which is higher than in the study by Kishore et al (82%).¹² Pain was complained by 48% of patients in the

present study which is comparable with the study by Kishore et al (40%).¹² These variations can be due to difference in work pattern and exposure to irritants and allergens.

In the present study duration ranged from 2 weeks to 20 years and majority of the patients presented within 6 months of duration (51%). This is similar to study by Bajaj where 60% of patients had the disease for less than 6 months duration.¹³

In the present study history of atopy was noted in 4 % of cases (3 females and 1 male) which is similar to study by Laxmisha et al which was 2%.¹⁴ However the study by Suman et al reported history of atopy in 36% of hand dermatitis.¹⁵ In the study by Lodi et al 50% and in the study by Agarwal et al 58.9% of the cases reported history of atopy which is much higher than the present study.^{7,16}

In the present study most common morphological lesion was scaling (64%) followed by hyper pigmentation (40%). This is comparable with the study by Kishore et al where scaling was the most common morphological pattern (82%).¹² The morphological presentation in different individuals varies depending on nature, extent, duration and treatment taken.

In the present study, out of 100 cases 42% were positive to patch test with Indian standard series of allergens .The positivity of patch test (42%) in the present study is similar to the study by Narender and Srinivas (44%).¹⁷ Higher rate of positivity was seen in studies by Laxmisha et al (52.7%) and Bajaj et al (59%).^{13,14} However very high rates of positivity was seen in study by Kishore et al (82%).¹² This variation is probably due to allergens exposed by study group is not a component of patch test and the quality of allergens included in the study.

In the present study 57% patients were positive for single antigen. This is similar to study by Kishore et al (64%).¹²

In this study 14% were positive for two antigens which is higher than the study by Kishore et al (16%).¹² 9.5% patients were positive for 3 or >3 antigens which is higher than that in study by Kishore et al (2%).¹² This variation is probably due to contact of multiple antigens by individuals and their sensitization. Simultaneous sensitization to more than one antigen is known to be common.

In the present study metals were the most common cause amongst them most common allergen was Potassium bichromate accounted in 21 %. This is comparable with the study by Sharma and Kaur et al (21.8%) Kishore et al (26%), Laxmisha et al (27.75%).^{4,12,14} Potassium bichromate is present in detergents and cement is a potent sensitizer, especially among construction workers (unskilled group).

In the present study Parthenium was the second most common allergen (15%) which was similar to the study by Bajaj et al (14.6%).¹³

CONCLUSION

Patch testing kit of Indian standard series is an excellent method of finding the possible allergen; it needs further modification and inclusion of other antigens in order to yield higher positivity of the patch test and better management of dermatitis. The difference in incidence in males and females is not due to difference in sex but rather due to difference in

exposure to allergens. Association between clinical patterns and the allergens is not predictable. As more number of cases may be related to occupation, a through history should be taken and potentially relevant allergens responsible for dermatitis of the patients should be identified. It is the responsibility of the physician to inform the list of allergens a patient must avoid based on the results of patch test. Prevention of hand and foot dermatitis is a combined effort by the patient, medical personnel, legislative bodies, central and local government, corporate industry and media.

REFERENCES

1. Berth- Jones J. Eczema, lichenification, prurigo and erythroderma. In Burns T, Breathnach S, Cox N, Griffiths C, editors. Textbook of Dermatology, 8th ed. West Sussex: Wiley –Blackwell; 2010.p.23.1.
2. Bajaj A K, Saraswat A. Eczema. Valia R G, Valia A.R, editors. IADVL Text book of Dermatology. 3rd edition. Bhalani publishing House, Mumbai 2008 page; 503-4.
3. Elston DM, Ahmed DD, Watsky KL, Schwarzenberger K. Hand dermatitis. *J Am Acad Dermatol* 2002; 47:291-9.
4. Sharma VK, Kaur S. Contact dermatitis of hands in Chandigarh. *Indian J Dermatol Venereol Leprol* 1987; 53:103-7.
5. Goh CL. Prevalence of contact allergy by sex, race and age. *Contact Dermatitis* 1986; 14:237-40.
6. Edman B. Sites of contact dermatitis in relationship to particular allergens. *Contact Dermatitis* 1985; 13:129-35.
7. Agarwal US, Besarwal RK, Gupta R, Agarwal P, Napalia S. Hand eczema, *Indian J Dermatol* 2014;59:213-224.
8. Akansha Trehan, Kishor Singh, Sanjay Kanodia, Amarjeet Singh Verma. Contact hypersensitivity in hand eczema A study with Indian standard series of allergens. *MedPulse – International Medical Journal* 2014; 1: 304 014.
9. Khairnar MR, Kumar P G, Kusumakar A. Updated BG prasad socioeconomic status classification for the year 2021. *J Indian Assoc Public Health Dent* 2021;19:154-5
10. Johansen JD, Aalto-Korte K, Agner T, Andersen KE, Bircher A, Bruze M, et al. European Society of Contact Dermatitis guideline for diagnostic patch testing - recommendations on best practice. *Contact Dermatitis*. 2015;73:195-221.
11. Handa S, Kaur I, Gupta T, Jindal R. Hand eczema: correlation of morphologic patterns, atopy, contact sensitization and disease severity. *Indian J Dermatol Venereol Leprol* 2012; 78:153-158.
12. Kishore NB, Belliappa AD, Shetty NJ, Sukumar D, Rauis, Hand eczema- Clinical Patterns and role of patch testing. *Indian J Dermatol Venereol Leprol* 2005;71:207-8.
13. Bajaj AK. Contact dermatitis. *Indian J Dermatol Venereol Leprol* 1983; 49:195
14. Laxmisha C, Kumar S, Nath AK, Thappa DM. Patch testing in hand eczema at tertiary care center. *Indian J Dermatol Venereol Leprol* 2008; 74:498-9.
15. Suman M, Reddy BS. Pattern of contact sensitivity in Indian patients with Hand eczema. *Indian J Dermatol, Venereol Leprol* 2003; 30:649-54.
16. Lodi A, Betti R, Chianelli G et al. Epidemiological, clinical and allergological observations on pompholyx. *Contact Dermatitis* 1992; 26:17-21.
17. Narendra G, Srinivas CR. Patchtesting with Indian Standard series. *Indian J Dermatol Venereol Leprol* 2002; 68:281-282.

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