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A study of clinical types of contact allergic dermatitis of hands and its association with allergens

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Abstract

Background: Hand eczema is one of the most common dermatological disorders caused by various exogenous and endogenous factors. The condition that is frequently multifactorial, usually disabling or distressing to the sufferer, and often difficult to treat

Objectives: To study the clinical types of contact allergic dermatitis of hands and to correlate the allergens related to allergic contact dermatitis of hands.

Methodology: This study was conducted among 100 patients from February 2014 to November 2014, in the Department of Dermatology, Basaveshwar Medical College, Chitradurga. A diagnosis was made by nomenclature proposed by Epstein. Patients were patch tested with the Indian Standard Battery approved by the Contact and Occupational Dermatoses Forum of India (CODFI).

Results: 45 (45%) of patients gave a positive history to aggravation by a contact with detergents and soaps, and 25 (25%) patients for cement. 70 (70%) had bilateral involvement. Out of 100 patients patch tested, 70 patients (70%) gave positive patch test results, 30 patients (30%) were negative for patch test, 49 patients (49%) were sensitive to a single antigen, 19 patients (19%) were sensitive to two antigens and 2 patients (2%) was sensitive to multiple antigens. Potassium dichromate was the most common sensitizer in male compared to female at the ratio of 2.2:1. Nickel sulfate was the most common sensitizer in females at the ratio of 0.07:1.

Conclusion: Hyperkeratotic eczema and patchy vesiculosquamous type of hand dermatitis were the common patterns, but clinical patterns and specific allergen association was inconclusive.

Keywords: Contact Allergic Dermatitis, Hands, Allergens

1. Introduction

The eczematous group of skin disorders embraces a number of entities in which endogenous, exogenous, environmental and cultural factors are often interwoven. This is particularly true of eczema affecting the hands, a condition that is frequently multifactorial, usually disabling or distressing to the sufferer, and often difficult to treat. This difficulty is partly due to the intrinsic nature of eczema itself and the special anatomical features of the palmar skin but also because of the role of the hands in everyday social life and work and the inability of the patient to completely follow the avoidance techniques^[1].

Hand eczema is one of the most common dermatological disorders caused by various exogenous and endogenous factors^[2].

Exogenous factors include contact irritants (chemical and physical), contact allergens (delayed and immediate hypersensitivity types), ingested allergens, infections and secondary dissemination^[2].

Endogenous factors include idiopathic causes, immunological or metabolic defects, psychosomatic causes and dyshidrosis^[2].

Hand dermatitis has multifactorial aetiology and is often difficult to exclude contact allergy as a cause or aggravating factor. The contact allergens vary from place to place and time to time depending upon socio-economic factors and extent of industrialization^[2].

Some dermatologists still genuinely think that clinical patterns of eczema are sufficiently discriminating between endogenous eczema and contact dermatitis to make patch testing redundant. However, the diagnosis of contact allergies by patch testing gives the clinician a distinct advantage in the subsequent management of the patient and frequently does improve the prognosis^[3].

This study focuses on identifying the exogenous agents causing hand eczema with the help of standard series of patch testing.

2. Objectives

To study the clinical types of contact allergic dermatitis of hands and to correlate the allergens related to allergic contact dermatitis of hands.

3. Methodology

This study was conducted over a period of 10 months from February 2014 to November 2014, in the Department of Dermatology, Basaveshwar Medical College, Chitradurga. During this period, a total number of one hundred patients with allergic contact dermatitis of hands attending the outpatient were included in this study. An informed consent was taken from all patients.

3.1 Inclusion Criteria

- All cases of allergic contact dermatitis of hands.
- Age group between 10 and 60 years.
- Both sex
- Patients who gave consent for patch testing.

3.2 Exclusion Criteria

- Pregnant mothers

- Primary irritant dermatitis
- Other endogenous eczemas
- Patients presenting with active, flaring dermatitis.
- Patients on any systemic corticosteroids, immunosuppressant, PUVA therapy for at least 2 weeks prior to patch test.
- If topical steroids are being used on the back, patch testing should be delayed for 3 days.
- Photo allergic contact dermatitis.

A diagnosis of allergic contact dermatitis of hands was made when the patient fit into the definition and nomenclature proposed by Epstein.⁴ Patients with lesion distal to the wrist line with minimal or no involvement of other areas in the body were interrogated for a detailed history with particular emphasis on mode of onset, site of initial lesions, progression, duration, relation to occupation, hobbies, aggravating and relieving factors and association with atopy or any other illness. Associated symptoms like pruritus, pain, dryness, scaling, thickening of skin, redness and oozing were noted. Patients were then examined to assess the morphology and extent of hand dermatitis.

All the patients with hand dermatitis were patch tested with the Indian Standard Battery approved by the Contact and Occupational Dermatoses Forum of India (CODFI), manufactured supplied by Systopic Laboratories, New Delhi.

Table 1: List of CODFI antigen included in the Indian Standard Battery include

Sl. No.	Compound	Concentration (%)	Vehicle
1	Control	100	Petrolatum (Pet)
2	Potassium dichromate	0.5	Pet
3	Neomycin sulphate	20.0	Pet
4	Cobalt chloride	1.0	Pet
5	Benzocaine	5.0	Pet
6	4-phenylenediamine base (PPD)	1.0	Pet
7	Parabens	15.0	Pet
	- Methyl-4-hydroxybenzoate	3.0	
	- Ethyl-4-hydroxybenzoate	3.0	
	- Propyl-4-hydroxybenzoate	3.0	
	- Butyl-4-hydroxybenzoate	3.0	
8	Nickel sulphate	5.0	Pet
9	Colophony	20.0	Pet
10	Gentamycin	20.0	Pet
11	Mercapto mix	2.0	Pet
	- N-cyclohexylbenzothiazyl sulfonamide	0.5	
	- Mercaptobenzothiazole	0.5	
	- Dibenzothiazyl disulfide	0.5	
12	Morpholinylmercaptobenzothiazole	0.5	
12	Epoxy resin	1.0	Pet
13	Fragrance mix	8.0	Pet
	- Cinnamic alcohol	1.0	
	- Cinnamic aldehyde	1.0	
	- Hydroxycitronellal	1.0	
	- Amylcinnamaldehyde	1.0	
	- Genaniol	1.0	
	- Eugenol	1.0	
	- Isoeugenol	1.0	
- Oakmoss absolute	1.0		
14	Mercaptobenzothiazole (MBT)	2.0	Pet
15	Nitrofurazone	1.0	Pet
16	Chlorocresol	1.0	Pet
17	Wool alcohols	30.0	Pet
18	Balsam of Peru	25.0	Pet
19	Thiuram mix	1.0	Pet
	- Tetramethylthiuram monosulfide	0.25	
	- Tetramethylthiuram disulfide	0.25	
	- Tetraethylthiuram disulfide	0.25	
	- Dipentamethylenethiuram disulfide	0.25	

20	Chinoform	3.0	Pet
21	Black rubber mix	0.6	Pet
	- N-isopropyl-N-phenyl-4-phenylenediamine	0.1	
	- N-cyclohexyl-N-phenyl-4-phenylenediamine	0.25	
	- N,N-diphenyl-4-phenylenediamine	0.25	
22	p-tert Butylphenol formaldehyde resin	1.0	Pet
23	Formaldehyde	1.1	Aqueous
24	Polyethylene glycol 400 (PEG 400)	100.0	Aqueous
25	Plant antigen or Parthenium hysterophorus		

The antigens were placed in aluminium Finn chambers in the prescribed sequence. The back was thoroughly cleaned with spirit and excessive hair was shaved before applying the patch test units. The patients were instructed not to have a bath or to wet the lesion and to refrain from strenuous physical activity which could result in profuse sweating. They were also instructed not to wear tight underclothes, to

avoid friction, rubbing or scratching and to avoid exposure to sunlight or UV light. The patches were removed after approximately 48 hours and the sites of contact of allergens were marked with a marking pen. Reading was taken after 30 minutes with instruction to avoid leaning against the chair while sitting, to allow the pressure effects of the patches to ware.

Table 2: The observations were graded according to the ICDRG recommendation (International Contact Dermatitis Group).

± or ?	Faint erythema	Doubtful reaction
+	Erythema and papules	Weak positive reaction
++	Erythema; papules and vesicles	Strong positive reaction
+++	Erythema, edema and vesicles/ulceration	Extreme positive reaction
-	No change	Negative reaction
IR	No induration	Irritant reaction

4. Results

This study was conducted among 100 patients and the results are as follows.

Table 3: Socio-demographic Profile of study subjects

Age group (years)	Frequency	Percentage	
10 to 19	9	9	
20 to 29	33	33	
30 to 39	20	20	
40 to 49	26	26	
50 to 59	10	10	
≥60	2	2	
Sex			
Male	53	53	
Female	47	47	
Occupation	Male	Female	Total
Housewife	-	32 (68.08%)	32 (32%)
Unskilled	41 (77.3%)	5 (10.65%)	46 (46%)
Skilled	6 (11.3%)	1 (2.1%)	7 (7%)
Student	3 (5.6%)	6 (12.7%)	9 (9%)
White Collar	3 (5.6%)	3 (6.3%)	6 (6%)
Religion	Male	Female	Total
Christian	0	3	3
Hindu	47	38	85
Muslim	6	6	12
Place	Male	Female	Total
Rural	28 (52.83%)	19 (40.5%)	47
Urban	25 (47.17%)	28 (59.5%)	53
Socio-economic status	Male	Female	Total
Lower class	35	19	54 (54%)
Middle class	18	28	46 (46%)

A total of 100 patients completed the study. An overwhelming 53% of the patients belong to the 3rd and 4th decade that is 20 to 39 years group. The youngest patient was aged about 16 years and the oldest aged about 60 years. In this study 53 (53%) were males and 47 (47%) females. The male to female ratio was 1.12:1. Among females 68.08% of patients were housewives and among males 77.35% of patients belong to the unskilled worker group. A total of 78 patients i.e. 78% gave a history of exacerbation, related to their occupation.

Out of 100 patients, 85% were Hindus, 12% were Muslims and 3% were Christians. In the present study 53 (53%) were from urban and 47 (47%) from rural area. Among females 59.5% were from urban area and among males 52.83% were from rural area. The proportion of Allergic Contact Dermatitis of hands was relatively more common in females from urban area and males from rural area. In our study, 54 (54%) of patients belong to lower class (socio-economic status) in which 35 patients were male and 19 are females. 46 (46%) are belong to middle class, in which 18 were males and 28 were females.

Table 4: Proportion of duration of the disease

Duration	Male	Female	Grand Total
<6 months	19	11	30 (30%)
6 months to 1 year	12	12	24 (24%)
1-2 year	4	10	14 (14%)
2-5 year	15	10	25 (25%)
> 5 year	3	4	7 (7%)
Grand Total	53	47	100 (100%)

It was difficult to categorize patients according to the duration of the disease. However it is important because it can help in determining the chronicity of the disease. 54% of patients suffering from ACD of hands from last 1 year and 25% had suffered from last 2 to 5 years duration. The duration was more or less equal in both sexes.

Table 5: Proportion of occupation and duration

Occupation	<6 months	6 months-1 year	1-2 year	2-5 year	> 5 year	Grand Total
Housewife	9	7	7	7	2	32 (32%)
Unskilled	14	11	5	14	2	46 (46%)
Skilled	3	1		1	2	7 (7%)
Student	2	3	1	2	1	9 (9%)
White Collar	2	2	1	1		6 (6%)
Grand Total	30	24	14	25	7	100 (100%)

In this present study, out of 100 patients, 54% of patients had ACD of hands from the last one year. Out of which 46.2% were belonged to unskilled worker group and 29.6% were housewives.

Out of 100 patients, 7% (7 patients) had duration of more than 5 years, in which the patients are more or less equal in all groups.

The aggravating factors taken into consideration included detergents, cement, plants, vegetables, chemicals and others including metals, ornaments and paints. In this present study out of 100 patients, 45 (45%) of patients gave a positive history to aggravation by a contact with detergents and soaps, and 25 (25%) patients for cement, 19 (19%) had history of aggravation on contact with plants, 11 (11%) for vegetables and 9 (9%) for chemicals.

Table 6: Proportion of symptoms

Symptoms	No. of patients	Percentage
Pruritis	97	97
Scaling	90	90
Thickening of skin	83	83
Fissuring	69	69
Pain	15	15
Redness	13	13
Oozing	6	6

Pruritis was the most common symptom which was seen in 97% of patients followed by scaling and thickening of skin 90% and 83% respectively. Fissuring was seen in 69%, pain in 15%, redness in 13% and oozing in 6%.

Table 7: Proportion of aggravating factors

Aggravating factors	No. of patients	Percentage
Detergent	45	45
Cement	25	25
Plants	19	19
Vegetables	11	11
Chemical	9	9
Others	11	11

Table 8: Extent of Dermatitis

Extent of Dermatitis	Unilateral	Bilateral
Patients	30 (30%)	70 (70%)

Table 9: Proportion of Extent of Dermatitis

Extent of dermatitis	Unilateral	Bilateral	Percentage
Finger	29	65	94
Palms	4	29	33
Dorsum of hands	5	31	36
Nail Changes	5	33	38
Extensive	3 (3%)	14 (14%)	17

In this present study out of 100 patients, 70 (70%) were bilateral involvement and 30 (30%) are unilateral involvement. On the bilateral group, fingers were involved in 92.85%, dorsum of hands in 44.28% and palms in 41.42%. On the unilateral group, finger involvement was 96.66%, dorsum of hand in 16.66% and palms in 13.33%.

Out of 100 patients, 38 (38%) had nail changes, in which 33 patients had bilateral involvement and 5 patients have unilateral involvement. The common nail changes seen were chronic paronychia, discolouration, horizontal ridges, irregular pitting and dystrophic changes.

Extensive involvement of hands seen in 17 (17%) patients out of 100, in which 14 patients had bilateral and 3 patients had unilateral involvement of ACD of hands.

Table 10: Proportion of morphology

Morphology	Male	Female	Total	Percentage
Pompholyx	1	0	1	1
Recurrent Focal palmar peeling	7	7	14	14
Hyperkeratotic palmar eczema	14	18	32	32
Ring eczema	5	2	7	7
Fingertip eczema	2	2	4	4
Wear and tear dermatitis	6	8	14	14
Apron eczema	0	0	0	0
Discoïd eczema	4	1	5	5
Chronic acral eczema	4	3	7	7
Gut eczema	0	0	0	0
Patchy Vesiculosquamous	10	6	16	16
Total	53	47	100	100

32% of patients presented with hyperkeratotic eczema, 16% with patchy vesiculosquamous type. These two morphological forms accounted for 48% of all cases. Other common morphological patterns were recurrent focal palmar

peeling (14%), wear and tear dermatitis (14%), ring eczema (7%), chronic acral eczema (7%), discoïd eczema (5%), fingertip eczema (4%) and pompholyx (1%). We did not have any cases of apron eczema or gut eczema.

Table 11: Proportion of patch test results

Patch Test Results	Total	Percentage
Single antigen Positive	49	49
Two antigen Positive	19	19
Multiple antigen Positive	2	2
Negative	30	30
Grand Total	100	100

Out of 100 patients patch tested, 70 patients (70%) gave positive patch test results, 30 patients (30%) were negative for patch test, 49 patients (49%) were sensitive to a single antigen, 19 patients (19%) were sensitive to two antigens and 2 patients (2%) were sensitive to multiple antigens.

Potassium dichromate was the commonest sensitizer with 27 patients testing positive for it, of which 21 patients had strong positive reaction. Nickel was the other common sensitizer with 14 patients testing positive of which 10 patients had strong positive reaction and 1 patient had extreme positive reaction. Among other metal salts, cobalt was positive in 5 patients.

Topical medicaments showed positive patch test result in 10 patients (10%) of which neomycin sulphate was seen in 6 patients (6%), gentamycin in 1 patient (1%) and nitrofurazone in 3 patients (3%).

Fragrance mix sensitivity was seen in 6 patients (6%), balsam of Peru in 2 patients (2%), other cosmetic products giving a positive patch result were parabens 2 (2%), colophony 2 (2%), 4-phenylenediamine was seen in 6 (6%) patients, epoxyresin 1 (1%), mercaptobenzothiazole 3 (3%), wool alcohol 5 (5%), thiuram mix 4 (4%) and p-tert butylphenol formaldehyde resin 4 (4%) patients. Plant antigen, parthenium hysterophorus was seen in 2 patients (2%).

Table 12: Proportion of patch test results (antigen wise)

	+	++	+++	Percentage
Petrolatum	0	0		0
Potassium dichromate	6	21		27
Neomycin sulphate	3	3		6
Cobalt chloride	1	4		5
Benzocaine	0	0		0
4-phenylenediamine	1	5		6
Parabens	1	1		2
Nickel sulphate	3	10	1	14
Colophony	0	1	1	2
Gentamicin	0	1		1
Mercaptomix	0	0		0
Epoxyresin	0	1		1
Fragrance mix	0	6		6
Mercaptobenzothiazole	1	2		3
Nitrofurazone	1	2		3
Chlorocresol	0	0		0
Wool alcohol	1	4		5
Balsam of Peru	1	1		2
Thiuram mix	1	3		4
Chinoform	0	0		0
Black rubber mix	0	0		0
p-tert butylphenol formaldehyde resin	1	3		4
Formaldehyde	0	0		0
Polythylene glycol 400	0	0		0
Parthenium hysterophorus	1	1		2

Table 13: Male and female ratio (antigen positivity)

Antigens	Male	Female	M:F ratio
1. Petrolatum	0	0	-
2. Potassium dichromate	18	8	2.2:1
3. Neomycin sulphate	3	3	1:1
4. Cobalt chloride	3	2	1.5:1
5. Benzocaine	0	0	-
6. 4-phenylenediamine	1	5	0.2:1
7. Parabens	2	0	-
8. Nickel sulphate	1	13	0.07:1
9. Colophony	1	1	1:1
10. Gentamycin	1	0	-
11. Mercaptomix	0	0	-
12. Epoxy resin	1	0	-
13. Fragrance mix	2	4	0.5:1
14. Mercaptobenzothiazole	1	1	1:1
15. Nitrofurazone	3	0	-
16. Chlorocresol	0	0	-
17. Wool alcohol	4	1	4:1
18. Balsam of Peru	2	0	-
19. Thiuram mix	3	1	3:1
20. Chinoform	0	0	-
21. Black rubber mix	0	0	-
22. p-tert butylphenol formaldehyde resin	2	2	1:1
23. Formaldehyde	0	0	-
24. Polythylene glycol 400	0	0	-
25. Parthenium hysterophorus	0	2	-

Our study showed potassium dichromate was the most common sensitizer in male compared to female at the ratio of 2.2:1. Nickel sulfate was the most common sensitizer in females at the ratio of 0.07:1. Other common sensitizer in females are fragrance mix and 4-phenylene-diamine at the ratio of 0.5:1 and 0.2:1 respectively.

Other common sensitizer in males were wool alcohol, thiuram mix and cobalt chloride at the ratio of 4:1, 3:1 and 1.5:1 respectively. The ratios of male and female were equal for neomycin sulfate, colophony, mercaptobenzothiazole and p-tert butylphenol formaldehyde resin

5. Discussion

The present study showed proportion of hand dermatitis attending Dermatology OPD was 3.16% in comparison with Warshaw EM *et al.* [5] which was 4.35%, Agrup G *et al.* [6] was 2.3% and Peltonen *et al.* 4% [7]. In the present study proportion of dermatitis is lesser than Warshaw EM *et al.* [5] (4.35%) and more than Agrup G *et al.* [6] (2.3%). The proportion of 3.16% is almost correlating with the study done by Peltonen *et al.* [7] (4%). This variation probably depends upon the different kinds of allergens sensitizing the individuals.

Hand dermatitis is common. Current general population prevalence rates for hand dermatitis range from 2% to 8.9% and it is estimated that 20% to 35% of all dermatitis affects the hands [1].

Present study showed the most common age group of presentation was between 20 and 39 years. An overwhelming 53% of our patients presented in this group. Our findings are lesser than Kishore NB *et al.* [8] (64%) and higher than Bajaj AK *et al.* [3] (45.9%).

In our study the probable cause of higher prevalence in this age group could be because it is the most active part of life and increased chances of exposure to allergens. Present study

showed mean age of 34.07 years and male mean age 36.09 years and female mean age 31.78 years. Our patients total mean age is higher than Kishore NB *et al.* [8] (30.95 years), Goh CL *et al.* [9] (32.5 years) and slight lesser than Skoet R *et al.* [10] (36.1 years). Our male patients mean age is slight higher than Goh CL *et al.* (34 years), Kishore NB *et al.* (33.7 years) and slight lesser than Skoet R *et al.* (37.1 years). Our female patients mean age is in accordance with Goh CL *et al.* (31 years), higher than Kishore NB *et al.* (28.2 years) and lesser than Skoet R *et al.* (35.1 years). The mean age in males and females in fourth decade as this is the most economically productive group than contact with allergens is more common.

The present study showed males relatively outnumber females at the ratio of 1.12:1 as similar to Kishore NB *et al.* [8] (1.21:1), Kumar P *et al.* [11] (1.2:1) and Goh CL *et al.* [9] (1.27:1) Since agriculture, mason work (cement work) is commonly done by males, more chances of contact with allergens. But Diepgen TL *et al.* [12] (1:1.54) and Bajaj AK *et al.* [3] (1:1.5) showed proportion was higher in females. Probably because of females were coming in contact with cleaning and cooking (housewives work) allergens sensitising the hands in these two studies.

Present study showed 68.08% are housewives. Our findings are in accordance with Kishore NB *et al.* [8] 68.2% and Sharma VK *et al.* [13] 66.6%. The increased exposure to a variety of chemicals is an occupational hazard of being a woman; particularly if she happens to be a housewife. She is prone to come in contact with various chemicals, detergents, cosmetics, bleaches and other substances which may act either as irritants or allergens. In addition to exposure to a host of chemicals she subjects her hands to the trauma of rubbing and scrubbing.

In males, 77.35% were unskilled workers. Our findings are higher than Kishore NB *et al.* [8] (53.6%) and Sharma VK *et al.* [13] (40.42%). This might be due to more exposure of unskilled workers to chemicals without taking much protection to hands.

As discussed earlier, wet work occurs in a wide range of occupation, water is hypotonic and acts as a cytotoxic agent on eroded skin. If surface lipid has been removed previously by suitable solvents, including detergents, water may dissolve the hygroscopic substances needed to keep the skin pliable. This potentiates the actions of actual allergens thus giving rise to a higher proportion of contact allergy in people involved in wet work [14].

In our study patients belonging to lower socio-economic status (54%) and middle class (46%) number was high when compared with the studies of Hald M *et al.* [15] (47.2%), (40.4%) and Skoet *et al.* [10] (42.8%), (30.6%) respectively. This probably can be attributed, that our patients belonging to lower and middle class were exposed more to the allergens and low socio-economic status is a risk factor for development of hand dermatitis [16]

As our study was based on cases attending the Government hospital, we did not have patients from upper class.

In our study, 54% of patients presented with ACD hands, less than 1-year duration. Our findings are slight higher than Hald M *et al.* [15] (52.2%) and lesser than Lerback A *et al.* [16] (67.6%). This variation is because most of our patients were manual labourers and housewives. Because of their rural background and low education status only 54% of our patients reported within one year of onset of hand eczema. Rest of the 46% presented after one year.

Present study showed pruritis (97%) was the most common symptom followed by scaling (90%) and dryness (83%). Our findings are higher than Kishore NB *et al.*, [8] Skudli KC *et al.* [17] and Lerback A *et al.* [16] But fissuring (69%) was lesser than Skudli KC *et al.* [17] (75%) and higher than Kishore NB *et al.* [8] and Lerback A *et al.* [16] Pain (15%) was lesser than Kishore NB *et al.* [8] (40%). These variations are probably due to work pattern and exposure to type of allergens.

Fissuring and pain were relatively less common, it was the most disconcerting for the patients as it resulted in significant morbidity and discontinuation of routine work.

Recurrence was a common feature seen among most patients in our study group. 45% of our patients gave a history of exacerbation in contact with detergents and soaps. Our findings are higher than Minoch YC *et al.* [18] (36.92%), Huda MM *et al.* [19] (30%) and Bajaj AK *et al.* [3] (18%), but lesser than Kishore NB *et al.* [8] (56%). Soaps and detergents have been implicated as a predisposing factors in various studies and also constituents in soaps and detergents such as potassium dichromate, lanolin, fragrances, colophony and enzymes may themselves pose as allergens as discussed earlier [3].

Eleven percent of our patients gave a history of aggravation in contact with vegetables, but in comparison with other studies, showed higher percentage of exacerbation on contact with vegetables, Minocha YC *et al.* [18] (38.46%), Huda MM *et al.* [19] (26.19%) and Bajaj AK *et al.* [3] (47.36%). Vegetables accounted for the higher number of cases of hand dermatitis in housewives [20]. This is probably due to the nature of work in different studies and in the present study.

Twenty-five percent of our patients gave a history of exacerbation in contact with cement and metals. Our findings are in accordance with Minoch YC *et al.* [18] (26.15%) and higher than Bajaj AK *et al.* [3] (14.03%), lesser than Sharma VK *et al.* [13] (42.5%). These variations are probably due to most of our unskilled workers are masons. Among metals, nickel has been reported to be the most common sensitizer.²⁰ Chromium is used in steel alloys, electroplating, tanning, dyeing, pigments. Chromates are also found in bleaching agents, matches, hide glues, detergents, brushless shaving creams, paints, polishes, ashes, fabrics and cements [13].

Twenty percent of our patients gave a history of exacerbation in contact with chemicals, plastics, rubber materials, leather products. Our findings are slightly higher than Sharma VK *et al.* [13] (18.75%), Bajaj AK *et al.* [3] (18%) and lesser than Minocha YC *et al.* [18] (22.3%). These variations are due to different working patterns and sensitization of individuals to different allergens.

Our study showed 70 (70%) patients had involvement of both the hands. This is lesser than Kumar P *et al.* [11] (77.71%) and Kishore NB *et al.* [8] (78%) studies. Unilateral hand involvement was 30% in our study. This is higher than Kishore NB *et al.* [8] (22%) and Kumar P *et al.* [11] (22.29%) studies. These variations are probably due to the geographical area and type of work done by our patients comparing the other studies.

Our study showed 94% of patients with finger involvement and dorsum of hands in 36%. These findings are higher than Lerback A *et al.* [16] and Kishore NB *et al.*, [8] but palms (33%) is lesser than Lerback A *et al.* [16] (35.1%) and Kishore NB *et al.* [8] (46%).

Nail changes (38%) is higher than Larback A *et al.* [16] (30.6%) and Kishore NB *et al.* [8] (22%). These variations are

probably due to nature of work and sensitisation of different anatomical sites for allergens.

14% of our patients showed extensive involvement of both hands. Our findings are almost on par with Kishore NB *et al.* [8] (16%). This is probably due to usage of both hands for working. In our study unilateral involvement was observed in 3% of patients, whereas in Kishore NB *et al.* [8] study no patient was affected and it is only unilateral. This probably can be explained on the basis of usage of one hand while working and getting exposed to allergens.

Our study showed hyperkeratotic eczema was the most common morphological type of 32% which is higher than Kishore NB *et al.* [8] (10%). The second most common type was patchy vesiculosquamous type (16%) and this is lesser than Kishore NB *et al.* [8] (28%). Other common variants like recurrent palmar peeling (14%) is lesser than Kishore NB *et al.* [8] (22%) and wear and tear dermatitis (14%) is higher than Kishore NB *et al.* [8] (8%). Ring eczema (7%), chronic acral eczema (7%) are higher than Kishore NB *et al.* [8] (2% each). The discoid eczema (5%), fingertip eczema (4%), pompholyx (1%) are lesser than Kishore NB *et al.* [8] 6%, 14% and 8% respectively. This variation is mainly due to reaction pattern in individuals to different antigens along with their type of occupation.

Our study showed 49% patients positive for single antigen and it is lesser in comparison with Kishore NB *et al.* [8] (64%). 19% were two antigen positive and it is slightly higher than Kishore NB *et al.* [8] (16%). Multiple antigens positive 2% is in accordance with Kishore NB *et al.* [8] (2%). 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.

Our study showed 70% of positive results. Our findings are higher than Hald M *et al.* [15] (45.6%) and lesser than Huda MM *et al.* [19] (92.5%), Sharma VK *et al.* [13] (80%), Bajaj AK *et al.* [3] (80.28%) and Kishore NB *et al.* [8] 30% of our study group showed negative results in comparison it is higher than Huda MM *et al.* [19] (7.5%), Sharma VK *et al.* [13] (20%), Bajaj AK *et al.* [3] (19.72%), Kishore NB *et al.* [8] (18%), and lesser in comparison with Hald M *et al.* [15] (54.4%). 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 patch test.

In our study potassium dichromate was the most common sensitizer with 27%. Our findings are higher than Anger T *et al.* [21] (12.1%), Meding B *et al.* [22] (9%), Li LF *et al.* [23] (6.5%), Hald M *et al.* [15] (4.9%), Shenoi SD *et al.* [24] (11.3%) and lesser than Kishore NB *et al.* [8] (32%) Next common was nickel sulphate 14%. Our findings are higher in comparison with Shenoi SD *et al.* [24] (10.8%) and lesser in comparison with Anger T *et al.* [21] (33.6%), Meding B *et al.* [22] (24%), Li LF *et al.* [23] (30.4%), Hald M *et al.* [15] (19.4%) and Kishore NB *et al.* [8] (18%). Fragrance mix (6%) is in accordance with Shenoi SD *et al.* [24] (6.1%) and lesser than Kishore NB *et al.* [8] (8%), Hald M *et al.* [15] (11.4%), Li LF *et al.* [23] (23.9%), Meding B *et al.* [22] (9%) and Anger T *et al.* [21] (18.2%). 4-phenylenediamine (6%) is higher than Anger T *et al.* [21] (4.8%), Hald M *et al.* [15] (2.9%), Shenoi SD *et al.* [24] (0.9%) and lesser than Li LF *et al.* [23] (8.7%). Neomycin sulphate (6%) is higher than Meding B *et al.* [22] (2%) and lesser than Kishore NB *et al.* [8] (12%) and Shenoi SD [24] (8.5%). These variations are probably due to presence of potassium dichromate in detergents and cement is known

to be potent sensitizer, especially among housewives and cement workers belonging to be the largest group in our study. It is a frequent cause of occupational contact dermatitis and chronic incapacity due to hand involvement [25]. Sensitivity to cosmetic products seems to be on the rise in India. This could be due to increased range of various cosmetic products today, when compared with the past [26].

Our study showed potassium dichromate was the most common sensitizer in male compared with female at the ratio of 2.2:1. Our findings are higher in comparison with Brasch J *et al.* [27] 1.09:1, Hald M *et al.* [15] 0.69:1. These variations are probably due to most of our male patients were belong to unskilled workers and in them cement was the most common sensitizer.

Nickel sulphate was the most common sensitizer in females at the ratio of 0.07:1 which is almost similar to Brasch J *et al.* [27] (0.25:1) and Hald M *et al.* [15] (0.12:1). This is probably due to females have more chances of exposure to detergents and metals compared to males in household activity. Other common sensitizer in females is fragrance mix 0.5:1, the findings are similar to Hald M *et al.* [15] (0.24:1) and Brasch J *et al.* [27] (0.82:1). 4-phenylenediamine was common in females at the ratio of 0.2:1. This is slightly lesser than Hald M *et al.* [15] (0.91:1) and Brasch J *et al.* [27] (0.8:1). This variation is probably due to females have more chances of exposure to cosmetic allergens compare to males.

In males, other common sensitizer was wool alcohol 4:1. In comparison it is very higher than Brasch J *et al.* [27] (0.8:1). Thiuram mix is also very high in male in comparison with Hald M *et al.* [15] (0.04:1) and Brasch J *et al.* [27] (0.96:1). Though the ratio of antigen sensitivity is higher for wool alcohol and Thiuram mix the number of cases reported to our study is very less [wool alcohol (5), Thiuram mix (4)]. This variation probably due to most of our male patients are outdoor workers, chance of exposure to these allergens is more in comparison with females.

6. Conclusion

In our study higher proportion of hand dermatitis was in the age group 3rd and 4th decade, males and belong to lower socio-economic status. We encountered a relative high degree of patch test positivity in our patients. Male and female ratio showed potassium dichromate common in males and nickel sulphate was common in females.

Hyperkeratotic eczema and patchy vesiculosquamous type of hand dermatitis were the common patterns, but clinical patterns and specific allergen association was inconclusive. A relatively high degree of positive patch test result in our study group and the presence of some unexpected positive findings such as topical medicaments gave us a distinct edge in further management of our patients. Clinical types were inconclusive and of little help in distinguishing between the various allergens.

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