

# CLINICAL EVALUATION AND PATCH TESTING IN HAND ECZEMA

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## **CERTIFICATE**

Certified that this dissertation entitled “**CLINICAL EVALUATION AND PATCH TESTING IN HAND ECZEMA**” is a bonafide work done by **DR.M.S.DEEPA**, Post Graduate Student of the department of Dermatology, Venereology and Leprosy, Madras Medical College, Chennai – 600 003, during the academic year 2007 – 2010. This work has not previously formed the basis for the award of any degree.

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## INTRODUCTION

Hand eczema is a descriptive diagnosis for dermatitis largely confined to the hands, and it does not make any presumption about the etiology.<sup>1</sup> It may be endogenous or exogenous (allergic or irritants) in origin.<sup>1</sup> Most of the cases of hand eczema have a multifactorial etiology,<sup>1</sup> wherein the eczema is caused and perpetuated by exogenous factors in individuals who are susceptible to such processes due to endogenous factors.<sup>1,2</sup> Identification and avoidance of the external contactants is of paramount importance in appropriate management of hand eczema. As clinical differentiation between chronic allergic and irritant hand eczemas is often difficult, patch testing becomes an important diagnostic tool for identification of the allergen/allergens responsible for the eczema.<sup>3</sup> Patch testing is a well established method of diagnosing allergic contact dermatitis. Patients with a history and clinical picture compatible with contact dermatitis are re-exposed to suspected allergens under controlled conditions to verify the diagnosis.

Properly applied and correctly interpreted patch tests are, at present, the only scientific proof of allergic contact dermatitis. This study was conducted to identify the allergens showing positive reactions in patch test in patients with hand eczema.

# REVIEW OF LITERATURE

## Hand eczema

### Historical back ground

It may be considered curious to single out eczema of the hands as being worthy of special study. In his long treatise of eczema, Hebra<sup>4</sup> devoted less than a page to the eczema of hands and feet, and this is in morphological terms. Fox<sup>5</sup> stated that eczema in these sites “is chiefly remarkable for the peculiar tenacity and persistence of the vesicles” and mentioned grocer’s and baker’s itch, but little else. Radcliffe – Crocker<sup>6</sup> emphasized the role of external irritants.

The recognition of hand eczema as a region of peculiar interest has come about gradually during this century and increasingly so in the last 50 years. There are several reasons for it. The most important was the rapid growth of industrialization in the west, especially enormous growth and development in dye and chemical industries. This led to an increase in realization of the importance of irritant and allergic dermatitis. In the increasingly complex environment of 20 th century the house wife too, encountered new causes of hand dermatitis.

Finally with increasing affluence, personal adornment flourished and the social, professional, and psychological effect of disfigurement on a visible area, such as the hands, undoubtedly prompted the increased use of potentially sensitizing hand creams

and a greater degree of medical attention.

Hand eczema is one of the commonest occupational health problems encountered in dermatology. It affects 1 % of adults<sup>7</sup>, with a male: female ratio of 2:1.<sup>8</sup> The lifetime prevalence varies between 5-7 % and 16.7% for women and between 5.2% and 9.5% for men.<sup>9</sup>

The incidence and causative factors vary from region to region, from rural to urban areas and from non industrialized areas to industrialized areas. Climate and occupation play an important part in determining the incidence. Women of child bearing age have a high incidence due to greater contact with soaps, detergents, vegetables, spices, etc. The incidence is high among certain occupational groups engaged in wet work such as hairdressers, cooks, domestics, nurses and print workers.<sup>10</sup>

## **Pathogenesis**

Hand eczema is multifactorial in etiology. A unifying feature in most cases is an underlying disruption in the stratum corneum, altering its barrier function. Transepidermal water loss increases with barrier disruption and is exacerbated by additional exposure to water.<sup>11</sup>

## **Understanding the Characteristics of the Hands and the Barrier Function of the Stratum Corneum**<sup>12,13,14,15</sup>

## **1. Characteristics of the hands:**

The palms have a peculiar skin structure; it is related to the fact that the hands are the body part most frequently exposed to external stimuli. The stratum corneum of the palms consists of approximately 50 layers, and is much thicker than the skin on other parts of the hands (about 15–20 layers). Also unlike the facial skin, the stratum corneum has no hair follicles and sebaceous glands. In areas where hair follicles are present, the super surface lipid membrane overlying the stratum corneum is predominantly produced by the sebaceous glands associated with hair follicles, while in the palms and soles the membrane is composed exclusively of lipid produced by metabolism of epidermal cells. The super surface lipid membrane is well developed in the face, whereas the membrane on the palm is thinner, which is compensated for by a thick stratum corneum. Additionally the back of the fingers, distal phalanx has no hair follicles and that the nail margins and fingertip have the same properties as the palms and finger-pulps.

## **2. Barrier function of the stratum corneum**

It has been shown that homeostasis of barrier function of the stratum corneum is maintained primarily by three factors;

- 1) Surfacerlipid
- 2) Intrinsic hydrophobic lipid of the stratum corneum such as ceramide.
- 3) Natural moisture-retentive factors.

Among these factors, ceramide has recently emerged as an important contributor to the moisture retention. Ceramide is the hydrophobic lipid that bridges the gap between the horny cells and forms the barrier that keeps water from passing through. The substance is supplied by a structure of the epidermal cell called a lamellar granule (or Odland body), and the process of its metabolism and production is under investigation.

The so-called natural moisturizing factors are thought to bind with water within the horny cells and play a role in enhancing the flexibility of the keratin. This factor originates from the keratohyaline granules of the epidermal cells, which are the soluble amino acids produced by degradation of fillagrin. In the cosmetic industry, great importance is placed on this factor. When the super surface lipid membrane and lipids such as ceramide between the horny cells are removed by artificial cause, internal water is lost from the stratum corneum (trans-epidermal water loss [TEWL]) and the way is left open for chemical stimuli or external substances including allergens and microorganisms to invade the body, leading to susceptibility to inflammation and allergic sensitization. Itchscratching also occurs (itch-scratch cycle) promoting entry and inflammation. The body part most vulnerable to the influences that permit this sequential process is the hand.

The most common clinical presentations of hand eczema are atopic hand dermatitis, pompholyx, and contact dermatitis (irritant contact dermatitis [ICD], allergic contact dermatitis [ACD]).<sup>12</sup> The diagnosis of hand dermatitis is determined by a review of the patient's medical history, a physical examination including other body sites as well

as the hands, and a thorough overview of the patient's daily activities with emphasis on occupation and hobbies. Irritant contact dermatitis usually is diagnosed by the absence of a positive patch test result; however, patch testing is essential in confirming a clinical diagnosis of ACD by identifying the allergens to which the patient has been sensitized.

## **Classification**

### **1. Based on etiological factors:**

#### **Endogenous:**

Atopic dermatitis

Discoid eczema

Pompholyx

Hyperkeratotic eczema

#### **Exogenous:**

Irritant contact dermatitis

Allergic contact dermatitis

Systemic allergens – drugs, metals

Dissemination from a focus

Infective dermatitis involving hands and feet.

### **2. Based on Morphologic pattern:**

Pompholyx

Recurrent focal palmar peeling

Hyperkeratotic palmar eczema

Finger tip eczema

Ring eczema

Housewives eczema (Wear and tear dermatitis)

Apron eczema

Discoid eczema

Chronic acral dermatitis

Gut eczema

Other patterns ( e.g patchy vesiculosquamous)

### **3. Based on duration of symptoms:**

Acute

Chronic

Acute on chronic

### **Atopic dermatitis:**

The most common site of atopic dermatitis is the hand in adults. Atopic adolescents and young adults develop hand eczema when exposed to school work, hobbies or occupational contacts. Meding et al reported that 22% of hand eczema patients were atopic.<sup>16</sup> Predisposing factors for developing hand eczema in atopics are, dry itchy skin, persistent diffuse atopic dermatitis, widespread dermatitis in childhood and atopic dermatitis of hand in childhood.<sup>17</sup> The characteristic distribution is on the

dorsal aspect of hand and fingers where it is seen as patchy vesicular rash that is itchy and irritable.<sup>18</sup> Wet work is the most important factor causing or aggravating hand eczema in atopics. Although atopic eczema resolves by puberty, it may recur as hand eczema in adults. Diagnosis is usually ascertained through history of atopy, distribution of lesion and occasionally raised IgE levels.

### **Irritant contact dermatitis**

Contact irritants are the commonest exogenous cause of hand eczema.<sup>19</sup> Acute irritant contact dermatitis results from contact with usually a strong reactive acidic or alkaline chemical, presents with erythema, edema, vesiculation and exudation. Chronic irritant dermatitis is caused by either the repetitive or cumulative effect of a variety of minor damaging factors. Chapping is predominantly seen on the back of the hands, while fissuring is seen on the palmar aspect.

### **Allergic contact dermatitis:**

Allergic contact dermatitis is an exogenous cause for hand eczema. Contact allergens produce hand dermatitis in individuals who are already sensitized to these antigens through two types of immunological responses. One is through the delayed type of hypersensitivity reaction (Type IV), as seen with chromium, nickel and rubber allergies. The second one is the immediate type of hypersensitivity reaction (Type I), that occurs as sudden itchy eruption of the hands following ingestion of sea food in sensitized individuals. Suman<sup>20</sup> et al reported 67 % of hand eczema was due to allergic contact dermatitis in their study.<sup>1</sup> Hand eczema is aggravated in sensitized individuals

due to oral ingestion of nickel or chromium. The commonest allergens are nickel, chromium, vegetables and natural rubber latex

### **Hyperkeratotic palmar eczema:**

Prolonged and repeated contact with certain agents can induce a reaction pattern on palmar skin manifesting as thickening, scaling and fissuring particularly involving tips, palmar surface of fingers and palms of one or both the hands associated with itching and pain. Such lesions termed as hyperkeratotic palmar eczema can occur either due to physical factors like dryness and friction, irritant reaction or allergic reaction.<sup>21</sup> Patterns of distribution of the lesions as a result of allergic contact dermatitis depend largely upon the causative agents pertaining to the habits, activities and occupation of an individual providing valuable clues for establishing the cause by patch testing.<sup>22</sup> This condition needs to be differentiated from psoriasis.

### **Finger tip eczema:**

It is a recurrent recalcitrant eczema seen on the palmar surface of the finger tips. It involves the palmar surface of the tips of some or all the fingers. The skin is dry, cracked and sometimes breaks into painful fissures. Usually it remains localized. It may occasionally extend down the palmar surfaces of the fingers and merge with palmar eczema. It involves most or all of the fingers, more predominantly those of the master hand and particularly the thumb and forefinger. It may start as a moist lesion, but eventually it becomes dry, cracked and scaly. Beneath the peeling skin a raw, red, cracked, painful surface is seen. It may represent cumulative irritant reaction or a

allergic contact dermatitis. Patch testing is useful in identifying the etiology.

### **Ring eczema:**

This form of hand eczema starts under a ring but frequently spreads to adjacent side of third finger or palm. It is more common in women, often starting after marriage or the arrival of child, but it may affect men. The onset is usually in third decade, but can be earlier in women wearing metal rings. This form of eczema is considered to be an irritant reaction to the concentration of soap and detergents under the rings. Patch test usually gives a low yield, except for nickel, but this is common in women of this age and it is usually irrelevant unless associated with metal use.

### **Dyshidrotic Eczema ( Pompholyx):**

Dyshidrotic eczema is a recurrent or chronic relapsing form of vesicular palmoplantar dermatitis of unknown etiology. Dyshidrotic eczema is also termed pompholyx, which derives from cheiopompholyx, which means "hand and bubble" in Greek. The etiology is multifactorial, it is considered a reaction pattern caused by various endogenous conditions and exogenous factors. Dyshidrotic eczema affects individuals aged 4-76 years; the mean age is 38 years. After middle age, the frequency of dyshidrotic eczema episodes tends to decrease. The male-to-female ratio for dyshidrotic eczema is 1:1.

Exogenous factors (eg, contact dermatitis to nickel, balsam, cobalt; sensitivity to ingested metals; dermatophyte infection; bacterial infection) may trigger episodes.<sup>23</sup> These antigens may act as haptens with a specific affinity for palmoplantar proteins of

the stratum lucidum of the epidermis.<sup>24</sup> The binding of these haptens to tissue receptor sites may initiate pompholyx. Emotional stress and environmental factors (eg, seasonal changes, hot or cold temperatures, humidity) may exacerbate dyshidrosis. In some patients, a distant fungal infection can cause palmar pompholyx as an id reaction. As many as 50% of patients with dyshidrotic eczema have reportedly had personal or familial atopic diathesis (eczema, asthma, hayfever, allergic sinusitis).<sup>25</sup> Isolated reports describe other possible causative factors, such as aspirin ingestion, oral contraceptives, cigarette smoking, and implanted metals, among others.<sup>25</sup>

A 3-year prospective study of the causes of dyshidrotic eczema (pompholyx) in 120 patients found causes of pompholyx related to contact exposure (67.5%), including cosmetic products (31.7%) and metals (16.7%); interdigital-plantar intertrigo (10%); and internal causes (6.7%), with an additional 15% with undiagnosed (idiopathic) causes, probably related to atopic factors.<sup>26</sup>

### **Apron eczema:**

The term was coined by Calnon. It is a localized eczema extending from the proximal part of two or more fingers and the metacarpophalangeal joints to the contiguous part of palm in a semicircular fashion. More common in women. Calnon described this entity as an endogenous eczema.

### **Discoid hand eczema:**

The pattern of lesion in this form of eczema is similar to that of discoid eczema

elsewhere in the body, but localized to the hands and fingers, usually to the back. One or more round nummular lesions develop and remain fixed to the site. They may be exudative or scaly. Intervening skin remains normal. The patches are resistant to treatment. When they recur, they do so in the same site. These features distinguish this type from the more common patchy form of hand eczema. Affects both the sexes, young atopsics are more susceptible. The relevance of any positive patch test that is found is difficult to establish.

### **House wives eczema (wear and tear dermatitis):**

It is one of the commonest type of hand eczema encountered. It is a chronic or cumulative irritant dermatitis caused by household work contactants such as washing soap, soda detergents, and cleansers. A variety of physical factors such as friction, trauma, cold and heat, play a part. Atopsics are more vulnerable. It commonly occurs on the palmar surface of fingers, interdigital spaces, palms, and dorsal aspect of fingers, particularly knuckles. The skin of affected area is dry, and may show superficial fissures. May be associated with finger tip or ring eczema.

### **Other Diseases Mimicking Hand Eczema:**

Major conditions that mimic hand eczema are:

**Palmar Psoriasis:**

Thick hyperkeratotic scaly plaques with painful fissuring can occur in psoriasis, this may resemble chronic hand eczema. Psoriatic plaques elsewhere on the body, on the soles etc. will clinch the diagnosis. When it is limited to the palms, a biopsy may be required for definite diagnosis.

**Tinea manum or ring worm of the hands:**

Itchy annular scaly skin patches involving both the palms and back of hands (sometimes limited to one side) can cause confusion in diagnosis of hand eczema. Scraping the scales and examination under microscope after dissolving in potassium hydroxide 10% solution will clinch the diagnosis of fungal infections of the hand.

**Candidal intertrigo:**

Commonly seen in housewives and hair dressers, candidal infection of the finger web spaces may look similar to contact dermatitis. Satellite lesions in the periphery and a positive potassium hydroxide microscopy will help in differentiating the yeast infection from hand eczema.

**Scabies:**

Distribution is on the web spaces with severe itching on the night. Commonly seen in paediatric age group. Scraping from the lesion demonstrates the mite.

The most common clinical presentations of hand eczema are atopic hand

dermatitis, pompholyx, and contact dermatitis (irritant contact dermatitis [ICD], allergic contact dermatitis [ACD]). The diagnosis of hand dermatitis is determined by a review of the patient's medical history, a physical examination including other body sites as well as the hands, and a thorough overview of the patient's daily activities with emphasis on occupation and hobbies. Irritant contact dermatitis usually is diagnosed by the absence of a positive patch test result; however, patch testing is essential in confirming a clinical diagnosis of ACD by identifying the allergens to which the patient has been sensitized.

## **Treatment**

### **Acute stage:**

In acute stage of hand eczema rest and bland applications are advised. Hands should be soaked in Burrow's solution ( aluminium acetate 1%) or potassium permanganate solution ( diluted 1:8000). Large bulla if present may be aspirated using a sterile syringe. Systemic antibiotics should be administered if secondary infection develops. As the eruption subsides soaks should be discontinued and zinc cream or oily calamine lotion can be substituted. In a few severe cases, a course of oral steroids may be justified. Topical steroids are useful in subacute stage of hand eczema.

### **Chronic stage :**

Particular attention should be paid to the possible causative factors, and a full occupational, social history, with details of hobbies and spare time activities is essential. The following measures are advised,

## **1.Avoidance of irritants :**

Education of the patient to the possible dangers is of paramount importance and printed advice sheets are helpful. Barrier creams and gloves can be tailored to individual needs.

## **2.Emollients:**

Emollient should be applied frequently as a thin smear rubbed gently into the skin. The choice of emollient will vary with the patient. Some people will benefit from a greasy preparation and others will prefer a cream based preparation.

## **3.Topical steroid:**

Topical steroids should be used sparingly and in the weakest potency. Even though the palms are thick, the epidermis can be rendered thin and fragile by potent topical steroids. In unresponsive cases use of potent steroid under occlusion may be considered. Intermittent use of potent steroid may prevent relapse.

## **4.Other measures:**

Tar pastes are useful in chronic unresponsive cases. Salicylic acid is helpful for hyperkeratotic and persistent scaly lesions. Oral PUVA chemotherapy. Topical PUVA and NBUVB have proved useful in several types of hand eczema. Radiotherapy is useful for stubborn hand eczema. Antihistamines reduces the itching. Acitretin is effective in chronic hyperkeratotic eczema. Cyclosporine is useful in some cases.

## **Patch testing:**

### **History:**

The principle of patch testing is to reproduce, in a clinical setting, a min-model of allergic contact dermatitis using allergens suspended in a vehicle at non irritant concentrations.<sup>27,28</sup>

Patch test was first employed in 1847 by Staedler by blotting paper method to test idiosyncrasy. Collins, an ophthalmologist, in 1889, applied atropine patches to his patients who were developing adverse reaction after instillation of atropine. However, Jadassohn has been rightly called the father of patch test as he first scientifically established the role of patch test in dermatitis medicamentosa. Later on Sulzberger contributed much by working on and highlighting the importance and standardization of patch testing, which represents one of the most important advances in clinical dermatology during the twentieth century.<sup>30</sup>

Sulzberger and Wise<sup>30</sup> in 1931 commented that in allergic contact dermatitis patch test should be employed, for it and it alone, can aid in the quest of the etiologic factor and in the study of the dermatitis. Colman in 1982 warned that the greatest abuse of patch testing is failure to use the test.<sup>31</sup> In 1986 Fisher concluded that properly applied and correctly interpreted patch tests are, at present, the only scientific 'proof' of allergic contact dermatitis. He also cautioned that education in the technique of patch testing is as essential to physicians in training as the learning of most surgical procedures.

Contact dermatitis is a disabling problem which can be identified by careful history, clinical examination, correlation of history and findings and finally patch testing.

Patch test consists of standard series of statistically common allergens and is of value when the contact dermatitis is suspected to an offending agent which cannot be pinpointed at. When performed and interpreted clearly it is a scientific proof of the allergic state. If the allergic state can be correlated with positive patch test then the validity of the test is relevant. Negative test does not mean contact dermatitis is ruled out as the patient may not be allergic to common sensitizers. If products which are nonirritant are suspected, repeated open applications tests can be performed. Although patch test is artificial and does not duplicate clinical exposure it is an important tool to find the contactant rather than by clinical trial and error.

Standard series of allergens are recommended for use in everybody undergoing patch testing. The specific standard series may vary according to the locality of the patch testing centre. Several organisations have attempted to identify the most important and relevant chemical allergens in their community. The chemicals in the standard series depend on which one is being used. The various series available are the European standard series, North American standard series and Indian standard series. Most test substances are single compounds but some of the tests are mixtures of closely-related chemicals. There are numerous other chemicals that have been reported to cause contact allergy occasionally. About 15% of patients that have positive reactions at patch testing react to an allergen that is not in the standard series. These allergens are detected using

other series of allergens or individual standardised chemicals that have been selected by the dermatologist. Several series have been developed for patients that present with dermatitis on specific sites of the body (e.g., 'face series', 'foot series'), and for those with certain occupations (e.g., 'hairdressers series', 'dental series') or other risk factors ('shoe series', 'cosmetic series').

### **Indian standard series**

Approved by CODFI (Contact and Occupational Dermatoses Forum of India) and manufactured/supplied by Systopic Laboratories, New Delhi.

Patch test unit is made from microporous tape (15X15cm) and aluminium patch test chambers (APC). Aluminium patch test chambers are 9mm internal diameter and a depth of 0.7mm. Aluminium patch test chambers are placed facing up with 2 cm distance from centre of each other. On top and bottom 2.0 cm each of micropore is left to obtain good adhesion. It is stored at 4 c.

**LIST OF CODFI ANTIGENS**  
**(INDIAN STANDARD SERIES)**

<b><u>S.NO.</u></b>	<b><u>Compound</u></b>	<b><u>Conc. %</u></b>	<b><u>Veh.</u></b>
01	Control	100	pet
02	Potassium Dichromate	1.0	pet
03	Neomycine Sulphate	20.0	pet
04	Cobalt Chloride	5.0	pet
05	Benzocaine	5.0	pet
06	4-Phenylenediamine base (PPD)	1.0	pet
07	Parabens	9.0	pet
	- Methyl-4-hydroxybenzoate	3.0	
	- Ethyl-4-hydroxybenzoate	3.0	
	- Propyl-4- hydroxybenzoate	3.0	
	- Butyl-4- hydroxybenzoate	3.0	
	- Benzyl-4- hydroxybenzoate	3.0	
08	Nickel Sulphate	5.0	pet
09	Colophony	10.0	pet
10	Epoxy resin	1.0	pet
11	Fragrance mix	8.0	pet
	-Cinnamic Alcohol	1.0	
	-Cinnamic aldehyde	1.0	
	-Hydroxycitronellal	1.0	
	-Amylcinnamaldehyde	1.0	
	-Geraniol	1.0	
	-Eugenol	1.0	
	-Isoeugenol	1.0	

	-Oakmoss absolute	1.0	
13	Chlorocresol	1.0	pet
14	Wool Alcohols	30.0	pet
15	Balsam of Peru	10.0	pet
16	Thiuram Mix	1.0	pet
	-Tetramethylthiuram monosulfide(TMTM)	0.25	
	-Tetramethylthiuram disulfide (TMTD)	0.25	
	-Tetraethylthiuram disulfide (TETD)	0.25	
	-Dipntamethylenethiuram disulfide	0.25	
17	Ethylene Diamine Dihydrochloride	1.0	pet
18	Black rubber mix	0.6	
	-N-isopropyl –N- phenyl-4-phenylenediamine	0.1	
	-N-cyclohexyl –N- phenyl-4-phenylenediamine	0.25	
	-N,N-diphenyl-4-phenylenediamine	0.25	
19	Formaldehyde	1.0	aq.
20	polyethylene Glycol 400	100	aq
21	Plant Antigens		
	(a) Parthenium hysterophorus		
	(b) Xanthium strucmarium		
	(c) Chyrsanthemum		

## ALLERGENS AND THEIR OCCURRENCES IN OUR ENVIRONMENT

### 1. Chromium (Potassium Dichromate)

Chromium is the fourth most common material in the earth's crust.<sup>32</sup> It is probably more accurate to use the term chromate, because chromium is unique in that the metal itself does not sensitize, but rather its salts.<sup>33</sup> Hexavalent chromate is the most powerful sensitizing chromate because of its solubility and capacity to penetrate the skin. Fregert et al pointed out the advantage of converting hexavalent chromium in cement to an insoluble trivalent form via the addition of ferrous sulphate.<sup>34</sup>

There are many causes of chromate allergy other than cement, including chrometanned leather, anti – rust, paint, timber preservative, the wood pulp industry, ash either from burnt wood in general or matches with chromate in the match head, coolants and machine oil. Welding, dye industry, chromium plating, bleaches, detergents etc.<sup>33</sup> Chromium compounds have been recognized for their primary irritant as well as for their potent sensitizing properties. In men the chromates are the most frequent industrial sensitizer, the commonest source being cement in the building industry. The chrome salt is an accidental contaminant of cement and is not an 'additive' in the usual sense. The role of chromium in foods in the production of chromate dermatitis is highly controversial.<sup>32</sup> Chromium may cause air borne contact dermatitis.

### 2. Neomycin Sulphate

It was first isolated in 1949 from *Streptomyces fradiae*. It consists of two active

components, neomycin B (78-88%) and neomycin C (10-16%). The third component present only in small amounts (2-5%) is the degradation product neamine (neomycin A). It is still one of the most commonly used topical antibiotics for treating varying cutaneous infections. It is used either as such or in combination with a corticosteroid depending upon the pathology of the disease. Hypersensitivity to neomycin is likely to be missed due to the relatively mild dermatitis it produces and secondly because of its frequent use in combination with topical steroids which suppresses its allergic action. It is a known potent sensitizer all over the world. The reported incidence varies from 2.5-6% and even more<sup>35, 36, 37</sup> In India the reported incidence is much higher due to its testing in selected group of patients rather than routine testing in all patients.<sup>38,39,40,41</sup> There are also various reports of cross sensitivity with the neomycin group of antibiotics; it cross reacts with framycetin, gentamicin, kanamycin, tobramycin, streptomycin and bacitracin.<sup>42</sup>

### **3. Cobalt Chloride**

Cobalt is frequently combined with nickel as a contaminant and the two metals always occur together. Cobalt is a contaminant of cement, and in cement dermatitis sensitivity to cobalt as well as chromate may occur.<sup>43, 44</sup> Cobalt dermatitis may occur in those involved in the manufacture of polyester resins and paints, hard metals used for cutting and drilling tools, and in the manufacture and use of cement. It may also occur in products of pottery, ceramics, metal alloys, glass carbide and pigments.

A combined cobalt and nickel sensitivity is more common in women because they

are sensitized by nickel, which always contains an impurity of cobalt. It is a matter of debate whether nickel – cobalt combined allergy is due to independent sensitization or cross sensitization.<sup>45</sup> Depending on the source of the contact, the pattern of cobalt dermatitis is in many cases identical with that of either nickel or chromate dermatitis. Dental plates and fillings may release sufficient amounts of cobalt to cause stomatitis or vesicular hand eczema in sensitive patients. A more wide spread disseminated or nummular eruption may also occur.

#### **4. Benzocaine :**

Benzocaine is a p-aminobenzoic acid derivative used as a local anaesthetic. It is a common and potent sensitizer. It is usually applied in the orifices of the body and to raw intertriginous areas, which renders sensitization easier. It can cross react with other compounds. 25% of benzocaine sensitivity patients react to paraphenylene diamine and paramminobenzoic acid esters used in suncreening agents.<sup>46</sup> It also cross reacts with procaine, sulphonamides and certain dyes.<sup>47, 48</sup> In order to detect more patients sensitive to topical anaesthetics it is necessary to test with other “Caine” anaesthetics.<sup>49,50</sup>

#### **5. Formaldehyde :**

Formaldehyde is a ubiquitous and potent sensitizer, industrially, domestically and medically. Formaldehyde exposure is difficult to estimate because the chemical besides being manufactured, imported and used as such is incorporated into a large variety of products and reactants in many chemical process, including formaldehyde releasers,

polymerized plastics, working fluids, medicaments, fabrics, cosmetics and detergents.<sup>51</sup>

Shampoos may contain formaldehyde. Because they are quickly diluted and washed off, only exquisitely formaldehyde consumers develop dermatitis of the scalp and face. Formaldehyde dermatitis from textiles is rare today because manufacturers have improved the fabric finish treatment and reduced the amount of formaldehyde residues in new clothing.<sup>51</sup> Garments made from 100% acrylic, polyester, linen, silk, nylon and cotton are generally considered to be formaldehyde free.<sup>52</sup> The frequency of formaldehyde positive patch tests in eczema patients is around 3% to 4%<sup>53</sup>

## **6. p-Phenlenediamine (PPD):**

p-Phenlenediamine (PPD) is a colourless compound that acts as a primary intermediate in hair dyes. It is oxidized by hydrogen per oxide and then polymerized to a colour within the hair by a coupler. Most cases of contact allergy to PPD occur due to contact with hair dyes, in either the client or hair dressers.<sup>54</sup> Once the hair is dyed and polymerized, it has been said to be nonallergic; however cases are occasionally seen in which people react to other persons dyed hair. This may be due to the dyeing not being carried out properly, leaving unploymerized hair dye.<sup>54</sup>

Patients with PPD allergy may cross react with benzocaine, procaine, sulphonamide, PABA sunscreens, azo and aniline dyes, anthraquinone and antihistamines.<sup>55</sup> Immediate type hypersensitivity to PPD, with extension urticarial reactions has been reported.<sup>56</sup>

## **7. Parabens:**

Parabens are alkyl esters of p-hydroxybenzoic acid. They are quite soluble in fats and are effective preservatives for cosmetics drugs and foods. In addition, many parentally administered medications, especially those in multidose packages, also contain parabens as preservatives. Parabens are known to produce contact hypersensitivity but are not strong sensitizers.<sup>57</sup> In India the incidence in a selected group of patients was over 5%.<sup>58</sup> Paraben sensitive leg ulcer patients can often use paraben preserved cosmetics on normal skin without adverse effect.<sup>59</sup>

## **8. Nickel Sulphate:**

Nickel is ubiquitous in the environment and constitutes about 0.008% of the earth's crust. Humans are constantly exposed although in variable amounts. Metal nickel as well as nickel salts give rise to contact allergy, metallic nickel only after corrosion. The corrosiveness of sweat, saliva and other body fluids to nickel and nickel alloys is a primary importance.<sup>60</sup> The commonest cause of sensitization is ear piercing,<sup>61</sup> particularly if there is a history of irritation at the time of piercing. Nickel sensitive patients with vesicular hand eczema worsen after an oral challenge with a diet naturally high in nickel.<sup>62</sup>

Food with high nickel contents are canned food, acid foods cooked in stainless steel utensils, instant tea, beans, mushroom, onions, spinach, tomato, peas, tea, cocoa and chocolate. The nickel content of food is partially determined by the components of

the soil in which it is grown, fungicides used on it and the equipment used in handling the food. <sup>63</sup> Nickel allergy does not seem to increase the change of developing other allergies<sup>64</sup> with the exception of cobalt, copper and palladium since these metals are commonly associated with nickel.

## **9. Colophony (Rosin):**

Colophony (rosin) is a widespread, naturally occurring material, which is the residue left after distilling off the volatile oil from the Oleoresin obtained from trees of the family Pinaceae. This yellow resin is used in the production of varnished, printing inks, paper, soldering fluxes, adhesive, polish, waxes, cosmetics (mascara, eye shadow), topical medicaments, and is a component of dental impression material and periodontal packings. Cross reactions between rosin, balsam of peru, oil of turpentine, wood tar, pine resin and spruce resin may occur. <sup>65</sup> The allergenicity of colophony can be reduced by chemical modification i.e., by hydrogenation of the non aromatic double bonds in the resin.

## **10. Epoxy Resin:**

Of all epoxy resins 95% consists of a glycidyl ether group formed by the reaction of bisphenol A with epichlorohydrin. Theoretically there are many different chemical compositions which can be used to make an epoxy resin. Epichlorohydrin / bisphenol A epoxy resin can vary in molecular weight from 340 to much larger polymers, the larger polymers having a much lower sensitizing capacity. <sup>66</sup>

Epoxy resin compounds should therefore contain little or no low molecular weight epoxy resin. The higher the molecular weight, the less sensitizing the compound is. Once epoxy resin becomes hardened, its sensitizing capacity becomes markedly reduced, but so called cured resins can contain uncured molecules and so have been known to sensitize.<sup>67</sup> Epoxy resins are used as adhesives and in paints, requiring great hardness and durability, for instance, in ships, in electrical insulation, as an additive to cement for quick bonding and strength. A negative patch test to epoxy resin does not necessarily mean that the patient is not allergic to the epoxy product which they have been using, for the following reasons.

- There may be some other epoxy resin in the compound
- They may be allergic to some other compound in the resin, for instance, dyes, fillers, plasticizers etc.
- They may be allergic to the hardener<sup>67</sup>

Both epoxy resins and hardeners can be irritant, as well as sensitizing, and if a patch test is applied at more than 1%, it may produce an irritant reaction. One of the commonest sources of sensitization in industry is the use of epoxy resin with fibre glass to make strong sheeting used for various purposes such as hulls for boats.

## 11. Fragrance Mix:

Fragrance and flavour substances are strong smelling organic compounds with characteristic, usually pleasant odors. <sup>68</sup> Fragrances are ubiquitous and used in perfumes and perfumed products. They are found not only in cosmetics but also in detergents, fabric softeners and other household products. Flavours are used for the flavouring of toothpastes, food and beverages. Perfume allergy evaluation may be difficult. A complete perfume compound consists of from 10 to more than 300 basic components selected from over 5000 raw materials, which can be divided into the following. <sup>68, 69</sup>

- 500 natural products isolated from various parts of plants, e.g., blossoms, buds, fruit, peel, seeds, leaves, bark, wood, roots or resinous exudates ;
- 5 animal products and their extracts (ambergris from the sperm whale, musk Tonkin from the testes of musk deer, castoreum from beaver glands, beeswax absolute from beeswax, and civet from glands of civet cat)
- Over 4000 synthetic fragrances

The most common reaction to fragrance materials is allergic contact dermatitis, but contact urticaria, photodermatitis and irritation may occur. Perfume allergy evaluation is made more difficult by the fact that labeling of perfumes with their ingredients is not required by law and by the secrecy policy of perfume manufacturers. That certain perfumes are sensitizers and photosensitizers (others are solely

photosensitizers) adds to the investigator's frustration.<sup>70</sup>

Screening with individual fragrances is impractical and time consuming and may give rise to multiple positive reactions and the excited – skin syndrome. Therefore, a perfume screening mix for patch testing has been developed to increase the ability to detect perfume allergy.<sup>71</sup> The current fragrance mix consists of light ingredients, each at a concentration of 1% : cinnamaldehyde, Cinnamyl alcohol, Eugenol, alpha amyl cinnamaldehyde, hydroxyl citronellal, geraniol, isoeugenol and oak moss absolute, with sorbitan sesquioleate as emulsifier. It has shown to be a valuable screening agent for perfume dermatitis.<sup>72</sup>

## **12. Mercaptobenzothiazole (MBT):**

Although a component of the mercaptomix, it is included in the standard series at 2% w/w on its own since the mix failed to detect 30% of patients who were MBT allergic when compared to simultaneous testing with 1% MBT, and 12 of 24 individuals who reacted to 2% MBT did not react to the mix.<sup>73</sup> According to Cronin,<sup>74</sup> Women who react to MBT have probably been sensitized by gloves or shoes, but in men the sensitization is probably by foot wear. Among numerous, other sources of contact with MBT are rubbers containing MBT and rubber handles, masks, elastic bands, tubing, elasticated garments and artificial limbs.<sup>75</sup> MBT may be present in a variety of nonrubber products, including cutting oils, greases, coolants, anti – freezer, fungicides, adhesives and veterinary medicaments.<sup>76</sup>

### **13. PEG – 400**

Poly ethylene glycol is a mixture of glycols. The lower molecular weights from 200 to 700 are liquids, while the higher weights 1000 to 6000 are solids. PEG of varying molecular weights are used extensively as vehicles in topical medicaments, suppositories, shampoos, detergents, hair dressing, insect repellents, cosmetics, tooth pastes and contraceptives.

In industry the PEG are used as solvents for nitrocellulose, as plasticizers for glue and casein, and as wetting agents in epoxy hardners. The low molecular poly ethylenes from 200 to 400 may cause allergic contact urticaria and eczema. The higher polyethylenes are not sensitizers.<sup>77</sup>

### **14. Chlorocresol (4- Chloro – m – Cresol):**

It is an efficient bactericide used as a preservative. In veterinary medicine it is used as in pesticides and fungicides. Chlorocresol dermatitis may occur from corticosteroid creams in which it is used as a preservative. It is also used in topical antiseptics, pharmaceutical products, protein shampoo, baby cosmetic, cooling fluids, adhesives and glues, inks, paints etc. it cross reacts with 4-chloro – 3 – xylenol (Dettol). It has a low sensitizing potential and is an infrequent sensitizer.<sup>78</sup>

### **15. Wool Alcohols (Lanolin)**

Lanolin is a natural product from sheep fleece and consists of a complex mixture of esters and polyesters of high molecular weight alcohols and fatty acids. The composition varies from time to time and place to place. Wool alcohols are a complex mixture of alcohols derived from hydrolysis of the oily, waxy fraction of sheep fleece. The general incidence of lanolin allergy is low. Lanolin allergy is most common among leg allergy patients.<sup>79</sup> The use of lanolin extends from topical preparations to polishes, anti – corrosives, printing ink and paper constituents. The allergens in lanolin are unknown but are probably present in its alcoholic fraction. Their allergenicity is increased by the simultaneous presence of detergent. Removal of the free fatty alcohols and detergents from lanolin reduced the hypersensitivity by 99% in selected lanolin sensitive patients.<sup>80</sup>

## **16. Balsam of Peru:**

Balsam of Peru is the natural resinous balsam which exudes from the trunk of the Central American tree *Myroxylon pereirae* after scarification of the bark. It consists of essential oil and resin, and is thus of the oleoresin type. The composition varies, and standardization is based on physical characteristics and the identification of some major chemical constituents. Balsam of Peru contains 30-40% of resins of unknown composition, while the remaining 60% - 70% consists of well known chemicals: benzyl benzoate, benzyl cinnamate, cinnamic acid, benzoic acid, vanillin, farnesol and nerolidol.

Many perfumes and flavorings contain components either identical with, or cross

reacting with, materials, contained in balsam of peru and other natural resins. Positive patch tests with one or more of these substances are often an indication of perfume allergy. The high incidence of perfume allergy is attributed to the widespread use of perfumes in cosmetics, topical preparation and household products. Systemic reactions following ingestion of balsams in eczema patients may result in flare – ups of their dermatitis. <sup>81</sup> The International Fragrance Association recommends that balsam of peru should not be used as a fragrance ingredient due to its sensitizing properties. <sup>82</sup> Another interesting phenomenon regarding perfume allergy is the quenching phenomenon described by Opdyke. <sup>83</sup> The sensitizing properties of Cinnamaldehyde, Citral and PHenylacetaldehyde were inhibited by eugenol, limonene and phenyl ethyl alcohol respectively. The mechanism behind quenching of sensitization is not known. The quenching effect seems to operate at two levels : Induction and Elicitation. It may exert its effect through blockade of antigen – presenting cells or by physicochemical mechanisms. <sup>84,85</sup> A product use test is important in the evaluation of a patient with suspected perfume allergy because of false positive patch test reactions. Generally, the composition of perfumes is complex, and the ingredients are not known to the investigator. The patient may tolerate some and not other perfumed products.

## **17. Thiuram Mix:**

The thiuram mix used in this series contains the following four compounds, each at a dilution of 0.25%.

- Tetra ethyl thiuram disulphide (TETD ; disulfiram)

- Tetra methyl thiuram disulphide (TMTD)
- Tetra methyl thiuram monosulphide (TMTM)
- Dipenta methylene thiuram disulphide (PTD)

These chemicals are used in the vulcanization of rubber as accelerating agents. They increase the rate of cross – linking by sulphur between the hydrocarbon chains of the uncured rubber and may also donate some sulphur to the reaction. In the fully cured product, unreacted accelerators remain. Some of these may migrate over time on to the surface of the finished article, together with other chemicals.<sup>86</sup> The use of thiurams is ubiquitous in the rubber industry. The compounds are encountered in rubbers for both industrial and domestic use.

Different manufacturers have preferences for particular thiurams which they use for particular applications. This fact probably explains geographical variations in the incidence of sensitivity to components of the mix.<sup>87</sup> Gloves are the commonest cause of rubber dermatitis, and the allergen is usually a thiuram. Release of thiuram from rubber gloves into sweat may vary between brands.<sup>88</sup> In individuals who are sensitive to thiurams the use of polyvinyl chloride plastic gloves, shoes with leather or polyurethane soles, and clothing elasticated with lycra (a polyurethane elastomer) may be required where indicated to reduce personal exposure to the allergens.<sup>86</sup> Thiurams have found wide use as fungicides, particularly for agricultural purposes but also for such applications as wall paper adhesives and paints. They have also been used in animal repellents. TETD, when administered systemically, causes inhibition of the enzyme

aldehyde, which causes skin irritation, erythema and urticaria. In the form of Antabuse, TETD is used to treat alcoholism. TETD has been used to treat vesicular hand eczema in nickel sensitive individuals.<sup>89</sup> A wide spread eczematous reaction may develop after the systemic administration of TETD to previously sensitized individuals.<sup>90</sup>

### **18. Ethylenediamine dihydrochloride:**

It is a colourless strongly alkaline caustic liquid used as a stabilizer in topical preparations. It has other uses, and dermatitis has been described due to it from the following sources :Floor polish remover<sup>91</sup> Epoxy hardner<sup>92</sup> and Coolant oil.<sup>93</sup> Its use has also been described in a number of other industries, rubber, dyes, insecticides, and synthetic waxes. There is a potential problem with systemic administration in those sensitized, either with drugs which contain ethylenediamine, for instance aminophylline, or with drugs chemically related to it, including, various antihistamines, among which are hydroxyzine hydrochloride, piperazine and cyclizine. Cases have been described with generalized erythroderma in patients who have become allergic to piperazine in local applications, who receive piperazine phosphate for thread worms.<sup>94</sup>

## 19. Black Rubber Mix:

- N-isopropyl – N – phenyl – 4 phenylenediamine (IPPD) 0.1%
- N – cyclohexyl – N- phenyl – 4- phenylenediamine (CPPD) 0.25%
- N, N-diphenyl – 4 – phenylenediamine (DPPD) 0.25%

These amines are used as antioxidants and antizonants in the production of rubber. They prevent rubber from drying or cracking by preventing oxidation by atmospheric oxygen or by decreasing the effect of ozone.<sup>95</sup> These substances are used widely in polymers (rubber, adhesives, and plastics), gasoline, lubricants and food; cured rubber accounts for the major consumption.

## AIM

1. To determine the causes of hand eczema among the patients attending out patient department of Dermatology during the period of August 2007-September 2009.
2. To report occupations frequently associated with hand dermatitis.
3. To indicate which substances were the more common allergens among individuals evaluated by patch testing for hand dermatitis.
4. To determine the predominant age group affected by hand eczema.
5. To estimate the underlying atopy association in patients with hand eczema
6. To determine the common site of involvement.
7. To document the various morphological types of hand eczema.

## MATERIALS AND METHODS

One hundred patients presenting with hand eczema were selected from outpatient Department of Dermatology at Madras Medical College, Chennai during the period of August 2007- September 2009. A detailed history was recorded with particular emphasis to occupation, types of agents handled during daily activities, and a thorough clinical examination was done to document the distribution patterns and types of lesions. KOH examination of scrapings from the lesions was carried out in all the patients to rule out dermatophytosis and scabies.

Patch testing was done in all cases utilizing the Indian standard series approved by CODFI (Contact and Occupational Dermatoses Forum of India) and manufactured/supplied by Systopic Laboratories, New Delhi. The standard patch testing technique using aluminium chambers was done and reactions were interpreted as recommended by International Contact Dermatitis Group (ICRG).

Patch testing with the plant antigens was done in suspected individuals. All the housewives were patch tested with 8 % solution of the soap used by them and with onion and garlic paste freshly prepared. Oils and other liquid contactants were used as such in suspected individuals.

The results were tabulated and analyzed. Ethical committee clearance was taken from the institute.

**Test site:**

Chambers were applied upon clinically normal upper back of the patient who had no active dermatitis anywhere upon the body. The patch tests were applied in strips of 10 units i.e., two vertical columns of 5 units, starting from left scapular region to the right scapular region avoiding the vertebral column. The number and exact positions of patch with names of antigens were recorded.

**Exposure time:**

All the patients were told to return at 48 hrs and advised to avoid bath, exposure to sunlight and dislodgement of the patches. When the patches were removed, the test sites were marked with gentian violet. For soaps the contact time was 24 hrs.<sup>96</sup>

**Time of reading:**

The readings were taken 30 minutes after the removal of patches at 48 hrs. For soaps reading was taken at 24 hours.

**Interpretation of reactions:**

Reactions were graded according to the recommendations of ICDRG ( International Contact Dermatitis Research Group ).

? : doubtful reaction, faintly macular erythema only.

+ : weak ( non-vesicular ) positive reaction, erythema, infiltration, possibly

papules.

++ : strong ( vesicular) positive reaction, erythema, infiltration, papules, vesicles.

+++ : extreme positive reaction, bullous reaction

- : negative reaction

IR : irritant reaction.

### **Exclusion criteria**

Care was taken not to patch test those:

With active disease

On steroids

On antimetabolites

### **False positive patch test reaction:**

Excessive concentration

Impure substance

Irritant vehicle

Excess allergen applied

Uneven dispersion

Current/ recent dermatitis in the patch test site

Current dermatitis at a distant site

Pressure effect of hard materials

Adhesive tape reactions

Artifact

Angry back.

**False negative patch test reaction:**

Insufficient concentration

Insufficient amount applied

Poor occlusion of patches

Patches applied at the wrong sites

Inappropriate vehicles

Readings performed too early

Substance degraded

Pretreatment of patch test site with topical steroid

UV irradiation of patch test site

Systemic treatment with immunosuppressants

**Adverse reactions to patch test:**

Flare up of dermatitis

Pigmentary changes ( hypo or hyperpigmentation) or

Keloid at test site

Bacterial infection

Viral infection

Active sensitization

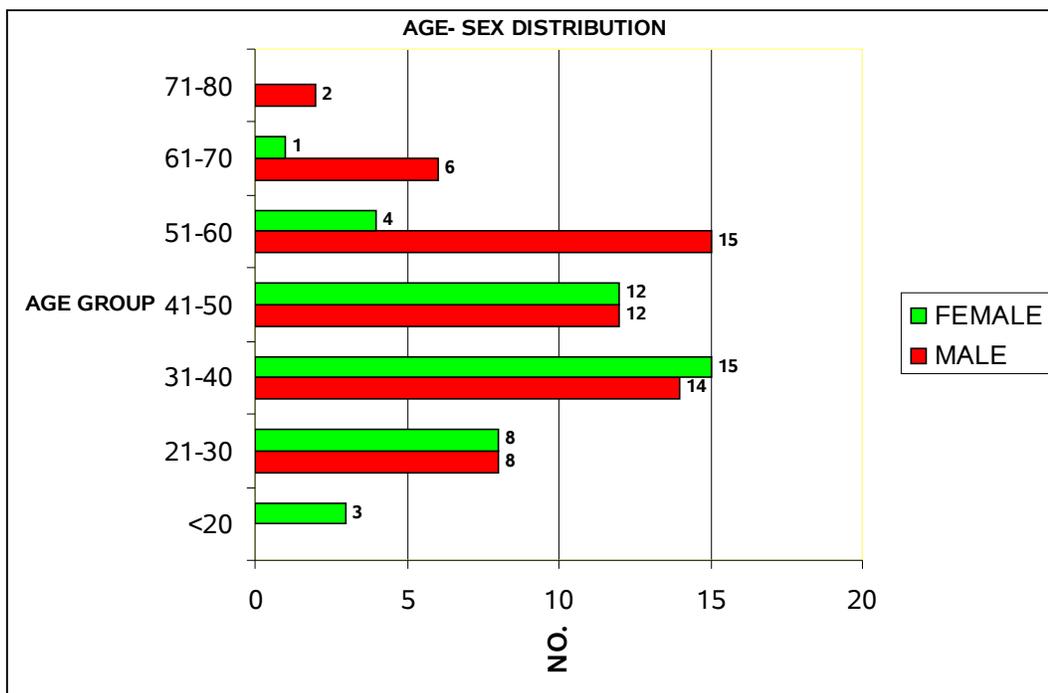
Anaphylaxis

# OBSERVATION AND RESULTS

A total of 100 patients with hand eczema were included in the study.

FIGURE - 1

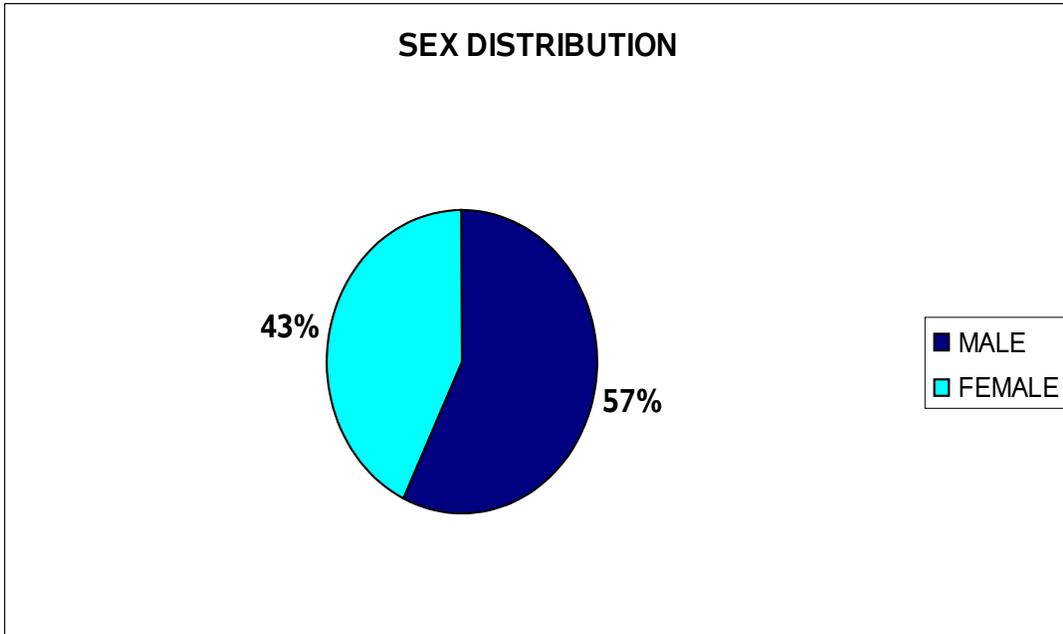
## AGE SEX DISTRIBUTION



Out of 100 patients 29 were in the 31-40 years age group. The youngest patient was 17 years old and the oldest patient was 73 years old. Male predominance was seen in 50-60 years age group.

**FIGURE – 2**

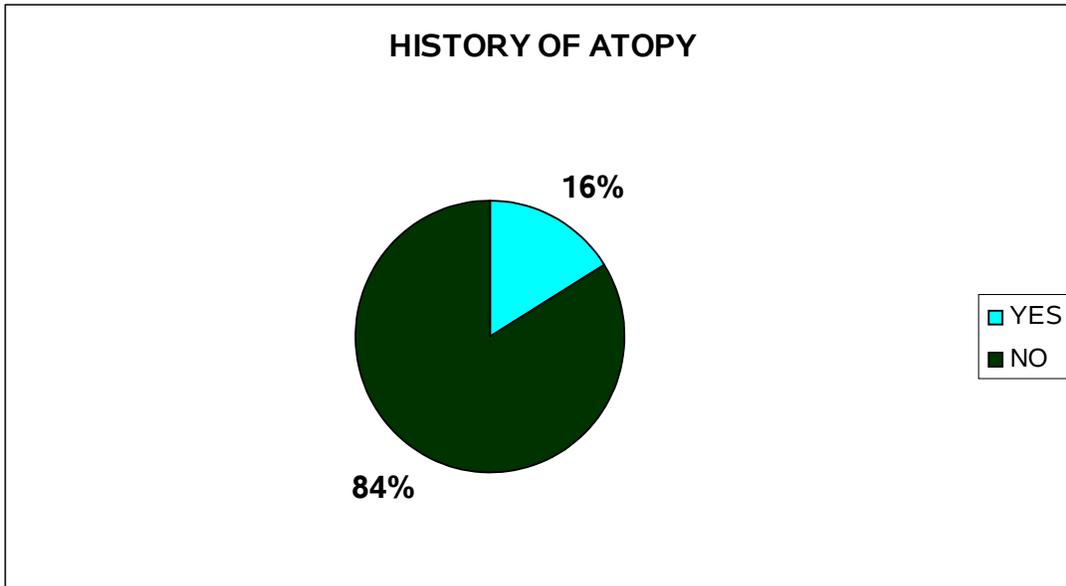
**SEX DISTRIBUTION**



Majority of patients 57 % were males. Male: Female ratio was 1.32:1

**FIGURE – 3**

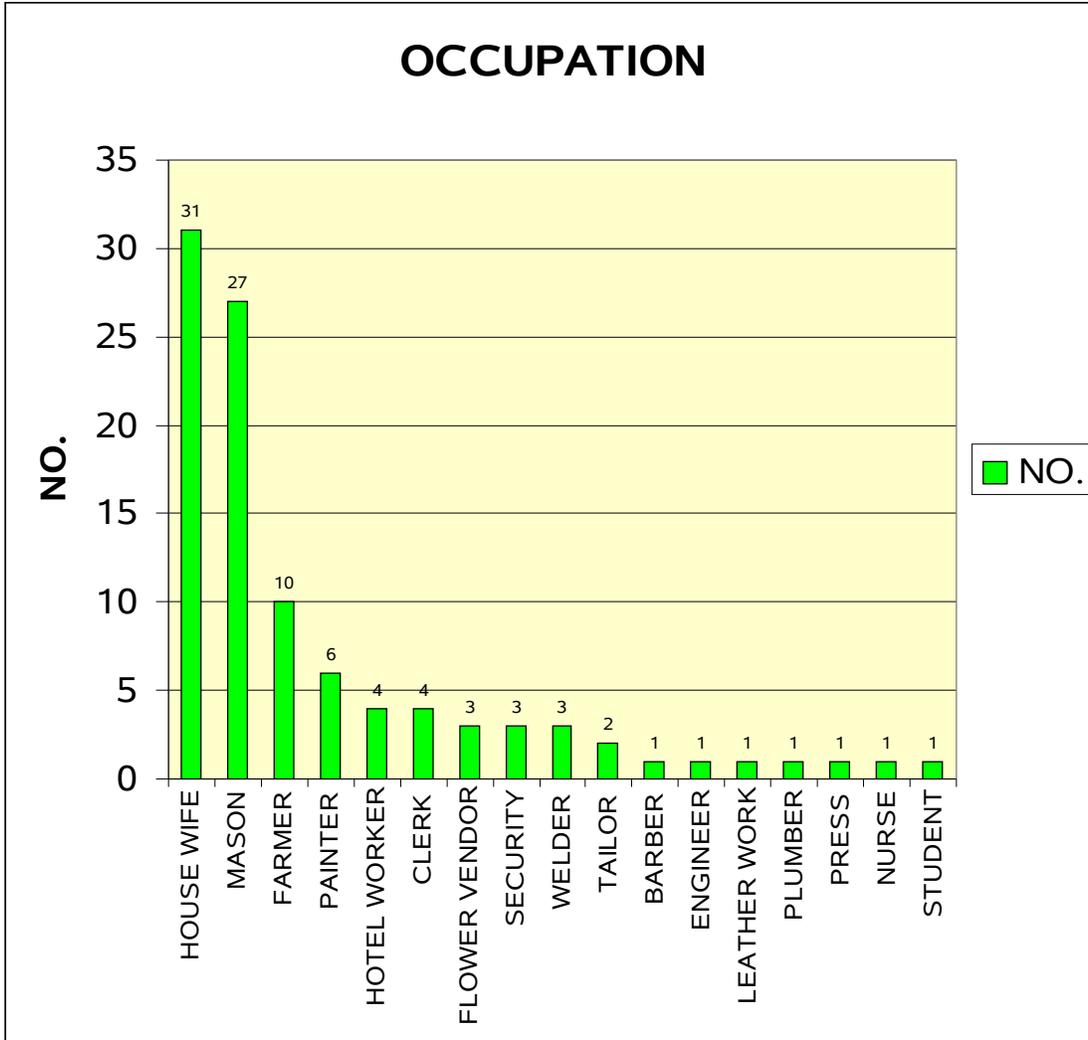
**HISTORY OF ATOPY**



History of atopy was present in 16 % of patients.

**FIGURE – 4**

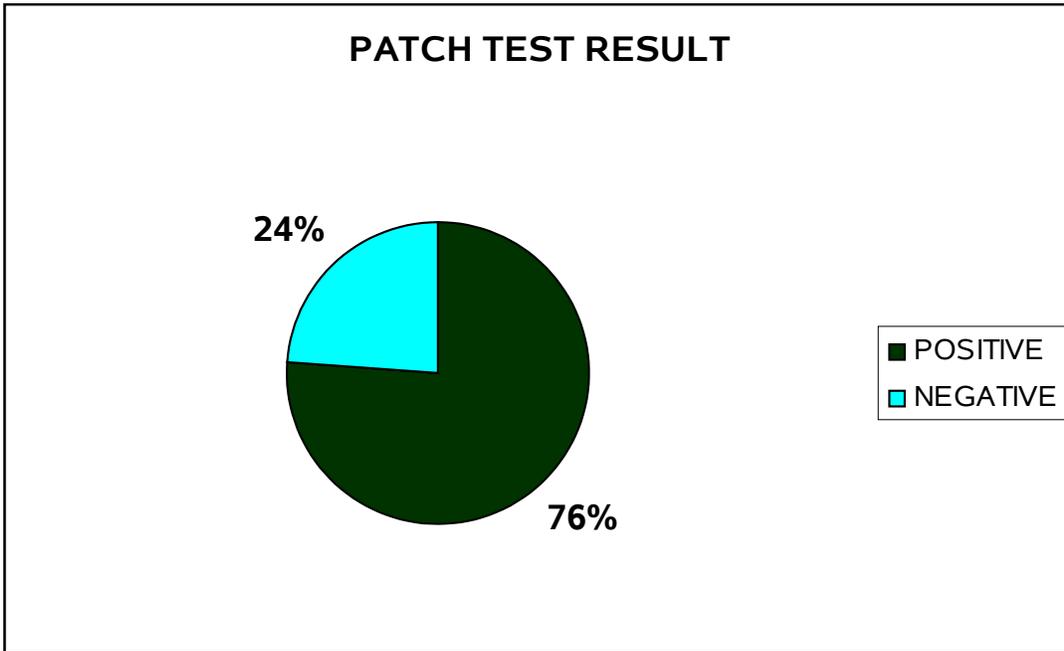
**OCCUPATION**



Among the various occupational groups, housewives formed the majority and accounted for 31% of total cases. Masons constituted second major group (27%).

**FIGURE - 5**

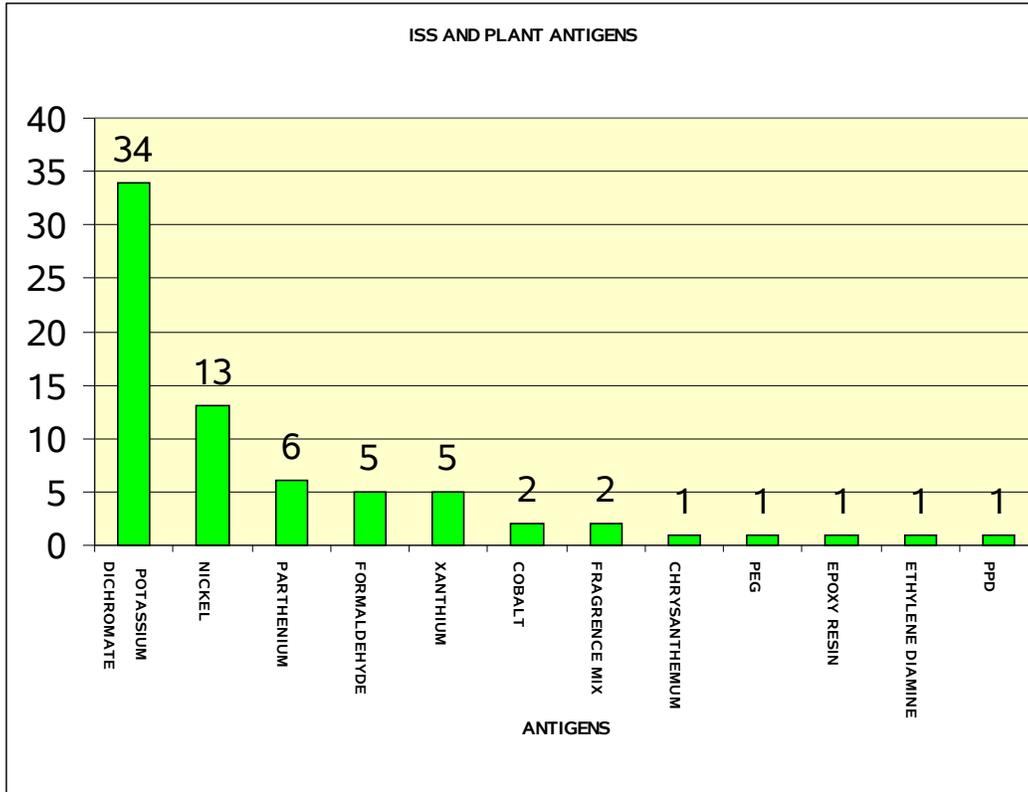
**PATCH TEST RESULT**



Positive patch test result was seen in 76 % of patients with hand eczema.

**FIGURE – 6**

**ISS AND PLANT ANTIGEN SENSITIVITY**



The most common sensitizer in our study group was potassium dichromate, constituting 44.73 % (34) followed by nickel sulphate i.e., 17.10 % (13), parthenium 7.89% (6), formaldehyde 5 (6.57%), xanthium 5 (6.57%), cobalt 2 ( 2.63%), fragrance mix 2 (2.67%), chrysanthemum 1 (1.31%), polyethylene glycol 1 (1.31%), epoxy resin 1 (1.31%) , ethylene diamine 1 (1.31%) and PPD 1 (1.31%) .

**TABLE - 1**

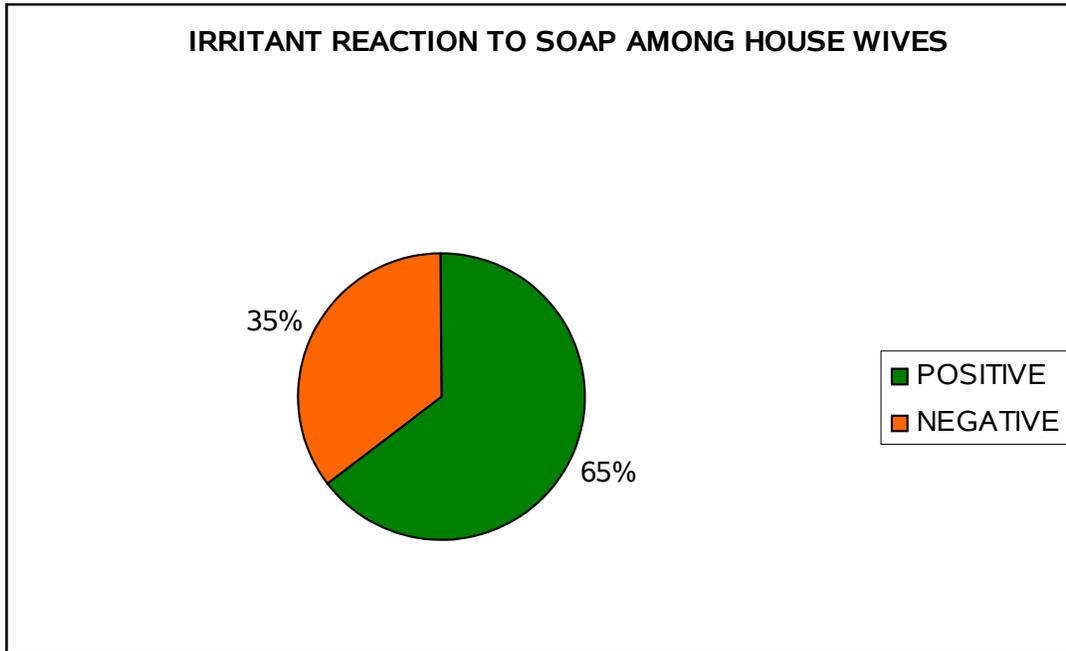
**AGE - SEX DISTRIBUTION OF PATIENTS WHO TESTED POSITIVE**

<b>AGE GROUP</b>	<b>MALES n=53</b>	<b>FEMALES n=47</b>	<b>PATCT TEST + n=76</b>	<b>TOTAL n = 100</b>
≤ 20		3	2	3
21-30	8	8	15	16
31-40	14	15	21	29
41-50	12	12	20	24
51-60	15	4	12	19
61-70	6	1	5	7
71-80	2		1	2

Majority of our patients belonged to 31-40 yrs age group and the mean age of patients who showed positive results was 44.23. The mean age of men and women who showed patch test positivity was 48.58 and 39.14 respectively.

**FIGURE – 7**

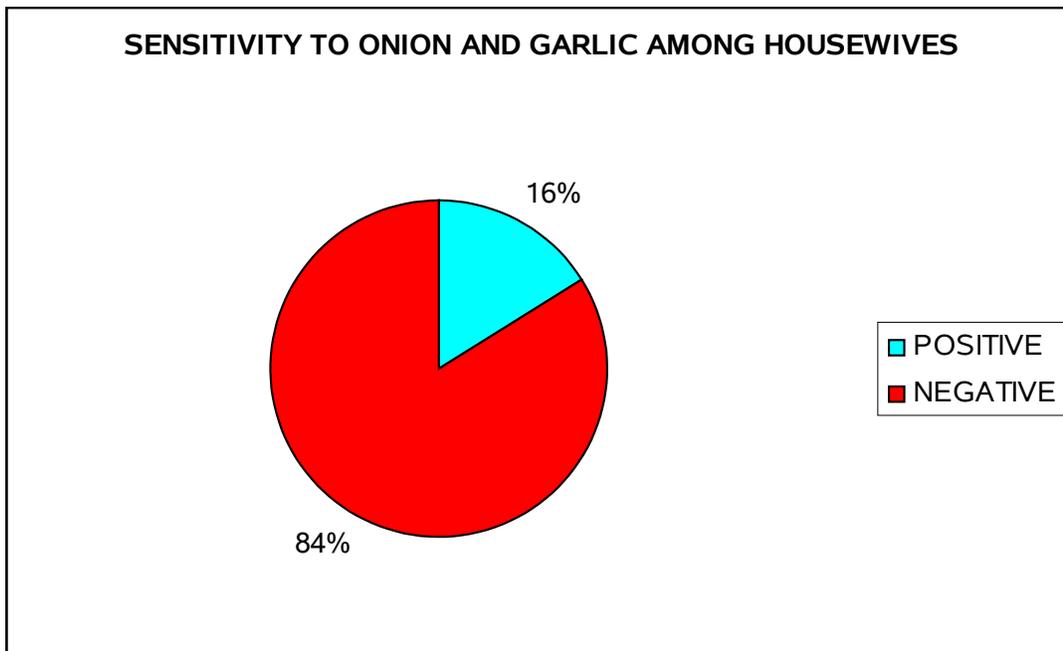
**IRRITANT REACTION TO SOAP AMONG HOUSEWIVES**



Among the house wives 35 % showed irritant reaction in the patch test done with soaps used by them.

**FIGURE – 8**

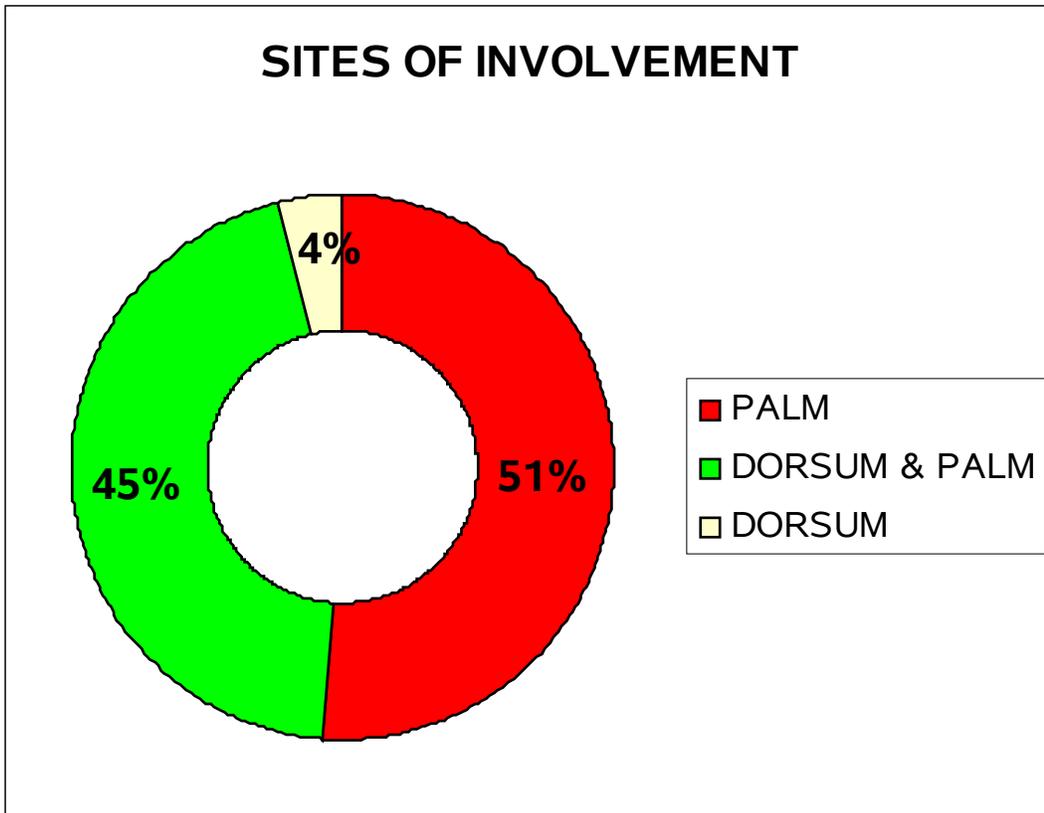
**SENSITIVITY TO ONION AND GARLIC AMONG HOUSEWIVES**



Among the house wives 16 % showed sensitivity to onion and garlic.

**FIGURE – 9**

**SITES OF INVOLVEMENT**

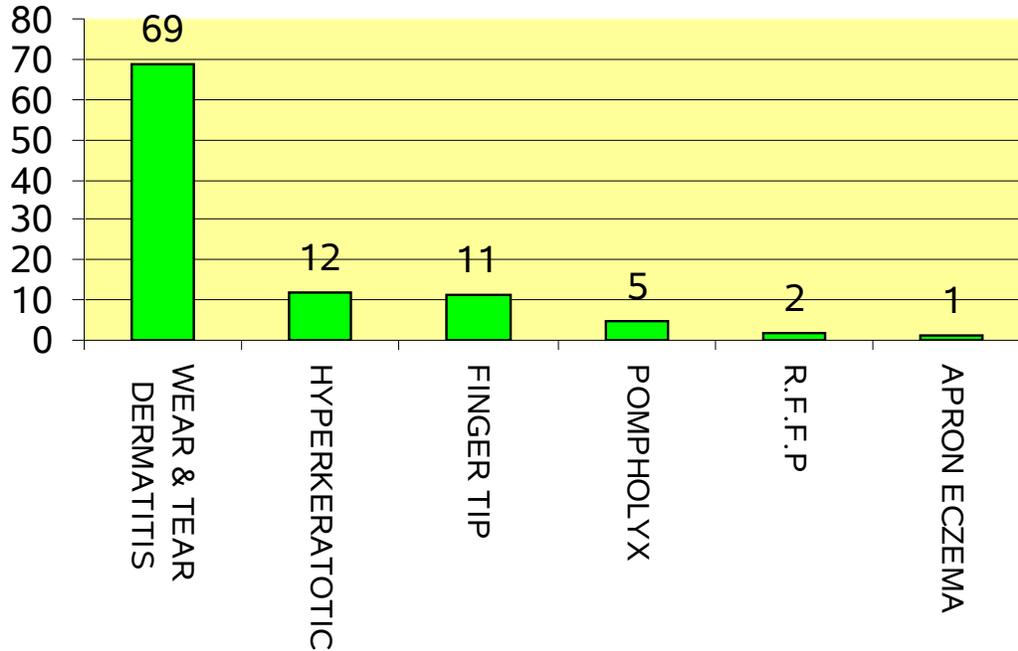


Among the 100 cases of hand eczema 51 % had palmar involvement, 45% had dorsal & palmar involvement and 4 % of patients had dorsal involvement.

**FIGURE - 10**

**MORPHOLOGICAL TYPES OF HAND ECZEMA**

## MORPHOLOGICAL TYPES OF HAND ECZEMA



Among the various morphological types of hand eczema wear and tear dermatitis was the frequent type in our study group constituting 69 % followed by hyperkeratotic type (12 %).

## DISCUSSION

A total of 100 patients were included in the study, out of which 76% showed positivity in patch testing in concurrence with the studies done earlier which ranges from 50% to 92.5% . Minocha <sup>97</sup> et al., reported 56.5% contact sensitivity among the patients with palmar hyperkeratotic dermatitis. Templet <sup>98</sup> et al., reported 54.4 % among patients with hand eczema. Huda <sup>99</sup> et al., reported 92.5% positivity among patients with hand dermatitis. Kishore <sup>100</sup> et al., reported 82.5% positivity among hand eczema. Laxmisha <sup>101</sup> et al., reported 52.5% positivity among patients with hand eczema.

Majority of our patients belong to 31-50 yrs age group and the mean age of patients who showed positive results was 44.23 which is in concurrence with other studies. <sup>100,102</sup> The mean age of men and women who showed patch test positivity were 48.58 and 39.14 respectively. Women showed positive patch test at an earlier age, this could be because of the earlier sensitization to allergens like nickel, cobalt and fragrance mix used in artificial jewelries and cosmetic products.

Among the 100 patients studied 57 (57%) were males and 43 (43%) were females, the ratio being 1.32:1 which is contrary to most studies where the incidence was higher in females. <sup>97,98,103</sup> This could be because of high number of semiskilled construction workers in our study group. Kishore <sup>100</sup> et al., and Laxmisha <sup>101</sup> et al., reported male predominance in their study group.

Atopic diathesis is the most common endogenous cause of hand eczema. In our

study group 16% of patients were atopics. Suman and Reddy reported history of atopy in 36% of their patients with hand eczema.<sup>8104</sup>Laxmisha<sup>101</sup> et al., had reported that only one out of 36 patients had atopy history in their study group.

Occupation has significant bearing on hand eczema because of exposure to various contactants at workplace.<sup>105,106</sup> In fact, occupational hand eczema comprises 90% to 95% of all occupational skin diseases in Denmark.<sup>105</sup> Among the various occupational groups, housewives formed the majority and accounted for 31% of total cases in our study, which is in concordance with other studies.<sup>97,100,104</sup> This can be explained on the basis of their coming in contact with agents of wide variety during day-to-day routines of household work of cooking, washing, cleansing and milking, feeding of animals particularly by housewives of rural background in India. Masons constituted second major group (27%) which is higher when compared to Laxmisha<sup>101</sup> et al., and Suman and Reddy<sup>104</sup> who has reported 14% masons in their study group. This could be because of the growth in construction industry in our region. The other occupational groups encountered in our study were, farmers (10 %), painters (6 %), hotel workers (4 %), clerk (4 %), flower vendors (3 %), security (3 %), welder (3 %), tailor ( 2 %), barber (1 %), mechanical engineer (1%), leather worker ( 1 %), plumber ( 1 %), press (1 %), nurse ( 1 % ) and student (1 %). The contact with water, which is hypotonic, and the dissolution of the surface lipids by detergents or solvents, may be the reason for a higher incidence of contact allergy in people involved in the above occupations.

The most common sensitizer in our study group was potassium dichromate, constituting 44.73 % (34) with a male predominance ( 85.29 %).This could be because

of a large number of construction workers in our study group. Chromates are present in cements, leather, matches, bleaches, yellow paints, varnishes, certain chromates containing glues, soap, and detergents.<sup>107</sup> Chromates are part of earth's crust, and traces of chromates are present in practically all raw materials.<sup>107</sup> Similar findings were reported by Laxmisha<sup>101</sup> et al., and Kishore<sup>100</sup> et al.,

The next common allergen was nickel sulphate i.e., 17.10 % (13), with a female predominance ( 84.61 %). Majority of the patients with nickel allergy were house wives as they are exposed to utensils, door handles, knobs, artificial jewelry etc. Nickel is ubiquitous in the environment and constitutes about 0.008% of the earth's crust. Nickel in metal and salt form gives rise to contact allergy, metallic nickel only after corrosion.<sup>108</sup> The corrosiveness of sweat, saliva and other body fluids to nickel and nickel alloys is of primary importance. Similar findings have been reported in various studies.<sup>103,109,110</sup>

Among those positive patients the common sensitizer in males was potassium dichromate (70.73%) and in the females it was nickel sulphate (31.42 %).

Positive reaction to parthenium antigen was seen in 6 patients (7.89%). Out of 6 patients 5 were farmers and one patient was a house wife. Men predominated in the parthenium sensitive group with 66.6% of the parthenium-positive patients being males. This may be due to greater outdoor exposure in men. Sesquiterpene lactones are the main sensitizers of the Compositae family. Other components, thiophenes and acetylenes are said to elicit only phytophotodermatitis, but recent studies have demonstrated that

some thiophenes and benzofuran derivatives possess not only phototoxic activity, but also sensitizing properties. Clinical manifestations vary from generalized eczema (20-30%), eczema of hands and face (24%), hand (36-44%), or facial eczema (11-28%).<sup>110</sup> Bajaj<sup>111</sup> et al., reported that 2 patients out of 71 cases of parthenium dermatitis presented with hand eczema (2.81%). Singhal<sup>112</sup> et al., have found hands and/or feet dermatitis to be the most frequent sites affected.

Out of 6 patients with parthenium positivity 5 showed positive reaction to xanthium. This could be because of cross sensitivity. One patient showed positivity to chrysanthemum, he was a flower vendor and occupational exposure could be the reason for the eczema. Xanthium strumarium is a weed belonging to the Compositae family with sesquiterpene lactone as the sensitizer. Parthenium hysterophorus and X. strumarium have shown a high rate of cross-sensitivity in Indian patients,<sup>113</sup> whereas the prevalence of cross reaction with chrysanthemum is generally low.<sup>114,115</sup>

Sensitivity to formaldehyde was seen in 5 (6.57%) patients. Formaldehyde is a ubiquitous sensitizer industrially, domestically and medically. The frequency of formaldehyde positivity in eczema patients is around 3 - 4%.<sup>116</sup> Among the five positive patients 3 were hotel workers, one was a paramedical personnel and the other one was a painter. One patient showed epoxy resin sensitivity and two patients showed fragrance mix sensitivity along with formaldehyde positivity.

Cobalt sensitivity was observed in two (2.63%) patients. Among the two one was a construction worker who also showed chromate sensitivity and the other one was a

painter with PEG sensitivity. Cobalt and nickel are present in cement and allergy to these metals can occur in the construction workers. However isolated occupationally relevant allergy to these metals from cement without concomitant allergy to chromate is very rare. It is because cobalt and nickel are present in insoluble form that has very low sensitization potential.<sup>21</sup> Thus, allergy to these metals is usually secondary in the setting of damaged skin incurred upon by the existing chromate allergy. Greater the clinical severity of chromate allergy more is the chance of sensitization from cobalt and nickel.

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Fragrance mix positivity was seen in 2 ( 2.63%) patients and these patients showed formaldehyde sensitivity also. In India the use of perfumes and fragrances are on the rise. We feel that in the near future more people with allergy to fragrance mix may be detected.

One patient (1.31%) showed sensitivity to Poly ethylene glycol (PEG). The patient was a painter. PEG is used as a solvent, plasticizer and wetting agent. Occupational exposure could be the reason for the sensitivity in this patient, who also showed sensitivity to Cobalt.

One patient (1.31%) showed sensitivity to Epoxy resin, he was a painter by occupation. Since epoxy resins are used as additive in paint occupational exposure could be the reason for this patients sensitivity. This patient also showed formaldehyde sensitivity.

Ethylenediamine dihydrochloride sensitivity was seen in one patient who was a leather worker. Occupational exposure could be the reason for his sensitivity. This patient showed positive reaction to potassium dichromate also.

One patient showed sensitivity to PPD. This patient was a barber who handles hair dyes regularly during his work and this could be the reason for his hand eczema.

One patient was a plumber and he showed sensitivity to the glue used in his daily work. Patch testing was done with the glue as such and the nature of substances in the glue could not be determined.

Among the 31 house wives patch tested with soaps and detergents 20 ( 64.51%) showed irritant reaction, among these 20 patients 9 patients did not show sensitivity to any other allergens. Chronic irritant dermatitis to the soaps and detergents could be the reason for the hand eczema in these patients. Detergents as a major cause of hand dermatitis among house wives has been reported in various studies.<sup>108,118</sup>

Garlic and onion has been reported as the most common sensitizer among the vegetables in hand dermatitis seen in house wives by various authors.<sup>103,118,119</sup> In our study 5 out of 31 house wives had sensitivity to onion and garlic. All the patients had finger tip eczema, which is the pattern seen in hand dermatitis due to vegetables.

The predominant site of involvement were palms (51 %), dorsum & palm (45 %) and only dorsal involvement in 4%. Dry, scaly skin was the most common

morphological picture, followed by hyperpigmentation, fissuring, and lichenification. Similar observation has been reported by Suman and Reddy.<sup>104</sup> Among the various morphological types of hand eczema wear and tear dermatitis was the frequent type in our study group constituting 69 % followed by hyperkeratotic ( 12 %), finger tip (11%), pompholyx ( 5%), recurrent focal palmar peeling ( 2%) and apron eczema ( 1%).

## SUMMARY

This study was undertaken using Indian standard series, plant antigens in suspected individuals, soaps, detergents, onion and garlic in housewives for patch testing patients with hand eczema.

Majority of patients belonged to 31-50 yrs age group. The mean age of patients who showed patch test positivity was 44.23. Hand eczema was predominantly seen in men in our study. Male : Female ratio was 1.32:1. Women showed positive patch test at an earlier age than men.

History of atopy was seen in 16 % of patients with hand eczema. Among the various occupational groups housewives formed the majority comprising 31 % followed by masons (27%).

Patch test was positive in 76 % of patients with hand eczema.

The most common sensitizer in our study group was potassium dichromate, constituting 44.73 % (34), followed by nickel sulphate 17.10 % (13). Among those positive patients the common sensitizer in males was potassium dichromate (70.73%) and in the females it was nickel sulphate (31.42 %).

The other antigens that showed positive reactions are, parthenium (7.89 % ), formaldehyde (6.57% ), xanthium (6.57% ), cobalt (2.63% ), fragrance mix (2.63% ), chrysanthemum (1.31% ), PEG (1.31% ), epoxy resin (1.31% ), ethylene diamine

(1.31% ), and PPD (1.31% ).

Out of 6 patients with sensitivity to parthenium 5 showed positive reactions to xanthium. Among the 2 patients with cobalt sensitivity one showed positive reaction to chromate and the other patient showed sensitivity to PEG. Fragrance mix positivity was seen in 2 patients and these patients showed formaldehyde sensitivity also.

Among the 31 house wives patch tested with soaps and detergents 20 ( 64.51%) showed irritant reaction, among these 20 patients 9 patients did not show sensitivity to any other allergens. Sensitivity to onion and garlic was seen in 5 house wives.

The predominant site of involvement were palms ( 51 %), dorsum & palm ( 45 %) and only dorsal involvement in 4%. Dry, scaly skin was the most common morphological picture, followed by hyperpigmentation, fissuring, and lichenification.

Among the various morphological types of hand eczema wear and tear dermatitis was the frequent type in our study group constituting 69 % followed by hyperkeratotic ( 12 %), finger tip (11%), pompholyx ( 5%), recurrent focal palmar peeling ( 2%) and apron eczema ( 1%).

## CONCLUSION

We encountered a high degree of patch test positivity in patients with hand eczema and the Indian standard series proved to be very useful, but lacking in certain cases like hand eczema in housewives. Housewives formed the bulk of our study group and a high degree of sensitivity to vegetables has been established in the past. Inclusion of the extracts of common vegetables and fruits in the series would be of immense value. Since more than half of hand dermatitis cases may be related to occupation, a thorough history should be taken by a knowledgeable clinician. Potentially relevant allergens in the workplace must be identified and tested. These allergens may not be contained in standard trays. A specific patch test series for the hands as in footwear series or textile series will be an aid in diagnosis of hand eczema.

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TREATMENT H/O:

EXAMINATION

GENERAL :

SYSTEMIC:

CUTANEOUS:

PAPULES            VESICLES            PUSTULES            OOZING

EROSION

THICKENING OF SKIN

DISTRIBUTION

MORPHOLOGICAL TYPE:

POMPHOLYX

RECURRENT FOCAL PALMAR PEELING

HYPERKERATOTIC PALMAR PEELING

RING ECZEMA

WEAR AND TEAR DERMATITIS

GUT ECZEMA

NUMMULAR ECZEMA

APRON ECZEAM

CHRONIC ACRAL DERMATITIS

NAIL:

PITTING            RIDGING            DYSTROPHY

THICKENING    DISCOLOURATION

HAIR:

MUCOSA:

ORAL

GENITAL

INVESTIGATION:

PATCH TEST :

BIOPSY :

DIAGNOSIS :

