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Original Research Article

A study of 300 cases of allergic contact dermatitis

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ABSTRACT

Background: Allergic contact dermatitis (ACD) is a delayed type of hypersensitivity from contact with a specific allergen. The aim of the study was to study age, sex incidence of allergic contact dermatitis and incidence of various allergen in patch test positive cases for that allergen in patients presenting to dermatology department in Meenakshi Medical College & Research institute, Kanchipuram.
Methods: Diagnosis of allergic contact dermatitis was made by patch testing.
Results: Most cases of allergic contact dermatitis fall in the age group of 41-50 years. More common in males than females. Allergic contact dermatitis to cement was found to be the commonest cause in our study.
Conclusions: Allergic contact dermatitis is common in middle age and incidence of disease is common in males than females. The higher incidence of allergic contact dermatitis to cement is due to more people being employed in construction working in this part of the world.

Keywords: Allergic contact dermatitis, Patch test, Allergen

INTRODUCTION

Allergic contact dermatitis is a very common type of skin disorder seen among patients attending dermatology clinics. Allergic contact dermatitis occurs when the skin comes in contact with an allergen that the skin is sensitive or allergic to. Allergic contact dermatitis occurs more commonly in adults.[1] It is a delayed type of induced sensitivity (allergy) resulting from cutaneous contact with a specific allergen to which the patient has developed a specific sensitivity.[2]

In other words allergic contact dermatitis is caused by the body's reaction to something that directly contacts the skin. Many different substances can cause allergic contact dermatitis, which are called 'allergens' like fragrances, small molecule preservatives, etc. Usually these substances cause no trouble for most people, and may not even be noticed the first time the person is exposed. But once the skin becomes sensitive or allergic to the substance, any exposure will produce a rash. Allergic contact dermatitis is the inflammation of the skin manifested by varying degrees of erythema, edema, and vesiculation. Diagnosis of allergic contact dermatitis is done by doing patch tests.[1]

METHODS

Study

This was a prospective observational study. 300 cases of allergic contact dermatitis who attended dermatology OPD of Meenakshi Medical College and Research Institute, Kanchipuram from July 2013- July 2016 and who gave consent for patch testing were included in the study.

Patient who is not willing for patch testing, who are on systemic corticosteroid & antihistamines therapy and patients with psychiatric illness were excluded from the study.

Method

A detailed history of the patients included in the study was taken. Duration and the type of occupation were noted for occupational cases of ACD. Morphology of the lesions and the sites of involvement were noted down. History, symptoms and signs were noted down. Past history of the patient for similar complaints was asked for. All the patients were subjected to blood investigation namely routine hemogram and blood sugar. Based on the type and nature of exposure to a specific occupation or Antigen, the patients were patch tested with the appropriate antigens. The patch test allergens used were approved by the Contact and Occupational Dermatoses Forum of India (CODFI). The following are included in the Table 1.

Table 1: List of patch test allergens with concentration.

S. No.	Allergen	Concen-tration (%)
1.	Petrolatum	
2.	Potassium dichromate	0.5
3.	Neomycin sulphate	20
4.	Cobalt chloride – hexahydrate	1
5.	Benzocaine	5
6.	4-Phenylenediamine (PPD)	1
7.	Parabens	15
8.	Nickel sulphate – hexahydrate	5
9.	Colophony	20
10.	Gentamycin sulphate	20
11.	Mercaptomix	2
12.	Epoxy resin	1
13.	Fragrance mix	8
14.	Mercaptobenzothiazole	2
15.	Nitrofurazone	1
16.	4-Chloro-3-cresol	1
17.	Wood alcohol	30
18.	Balsam of Peru	25
19.	Thiuram mix	1
20.	Chinoform	3
21.	Black rubber mix	0.6
22.	P-tert-butylphenol formaldehyde resin	1
23.	Formaldehyde	1.1
24.	Polyethylene glycol	100
25.	Plant antigens a) Parthenium hysterophoru b) Chrysanthemum c) Xanthium strumarium	

Patch testing was done as follows- allergens were stored in a refrigerator at 4 ^{o}C to 8 ^{o}C. The allergens were taken out from the refrigerator 15 minutes before testing. The patch test unit was marked with indelible ink - the names of the antigens to be tested. The protective foil was removed and the patch test unit was placed on the table with the aluminium chambers facing up. 2-3 mm length of the allergens ointment from the syringe was put in the center of the aluminium chambers. Alcohol or aqueous based allergens were applied using a filter paper disc. Allergens were applied on the patch test unit with first allergens in the top right hand corner and then downwards in the region of upper back. The upper back of the patient was gently cleaned with spirit before application of antigens. Patches were removed after 48 hours (2 days). Reading was taken after 45-60 minutes. A second reading was taken on day 4 after application to confirm the presence of allergic reaction.

Instructions to the patient

Following instructions were given to the patients.

- Patch test must be left in place for two days and two nights.
- Not to take bath or wash or wet the back during the period.
- To avoid tight underclothes.
- To avoid exercise or any other activity causing sweating.
- To avoid friction or rubbing and lying on back.
- To avoid scratching the patch test site.
- To avoid exposure to sunlight/UV light.
- To report immediately if there is severe itching or irritation.
- To come after 48 hours and 96 hours for patch test reading.

Plant antigens

As the plant antigens cause phytophotodermatitis, a photopatch test is done. Two sets of antigens were applied one on either side of the vertebral column. The patients were instructed to come after 48 hours. The plant antigen strip consists of non-allergenic adhesive tape on which 4 paper discs have been fixed at appropriate distances. The content of each disc is indicated on the back of the strip. The polythene sheet protecting the antigen impregnated discs is separated. The antigen impregnated discs were wetted with a drop of distilled water and then applied. The strips are then removed and readings taken. Then one side is occluded and the other side is irradiated with UVA in a dose of 5 J/cm^2 or sunlight. Then the patients were asked to come after 72 hours or 96 hours. The readings on both sides are then compared.

RESULTS

300 patients with history of exposure to a specific substance and also who was patch test positive for the respective allergens were included in the study. Out of the total 300 cases, allergic contact dermatitis to cement tops the list with 130 cases (43.33%). Contact dermatitis to nickel is the second common with 31 of a possible 300 cases (10.33%). Third common is contact dermatitis to plant antigens i.e. phytophotodermatitis with a total of 27 cases (9%). Other substances are paint – 20 cases (6.7%), kumkum – 17 cases (5.7%), rubber – 17 cases (5.7%), leather – 14 cases (4.7%), oil and grease – 14 cases (4.7%), turmeric – 11 cases (3.7%) and other miscellaneous substances – 19 cases (6.3%) as given in Figure 1.

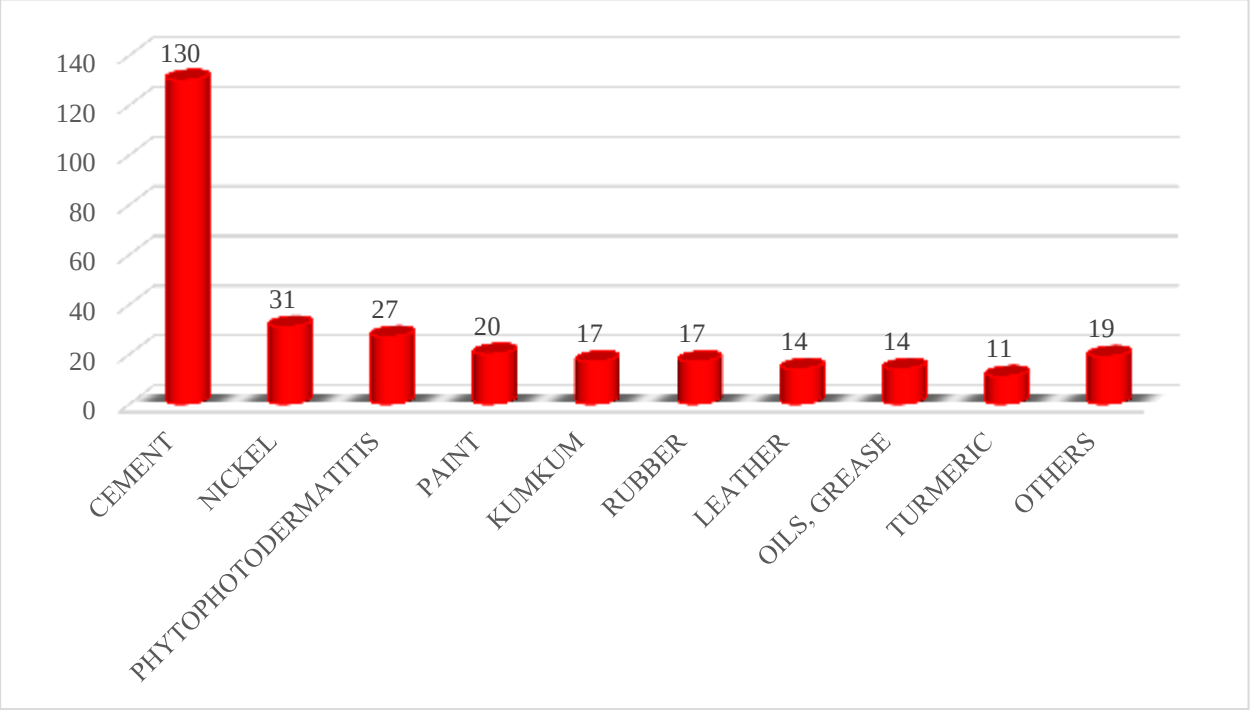


Figure 1: Incidence of allergens.

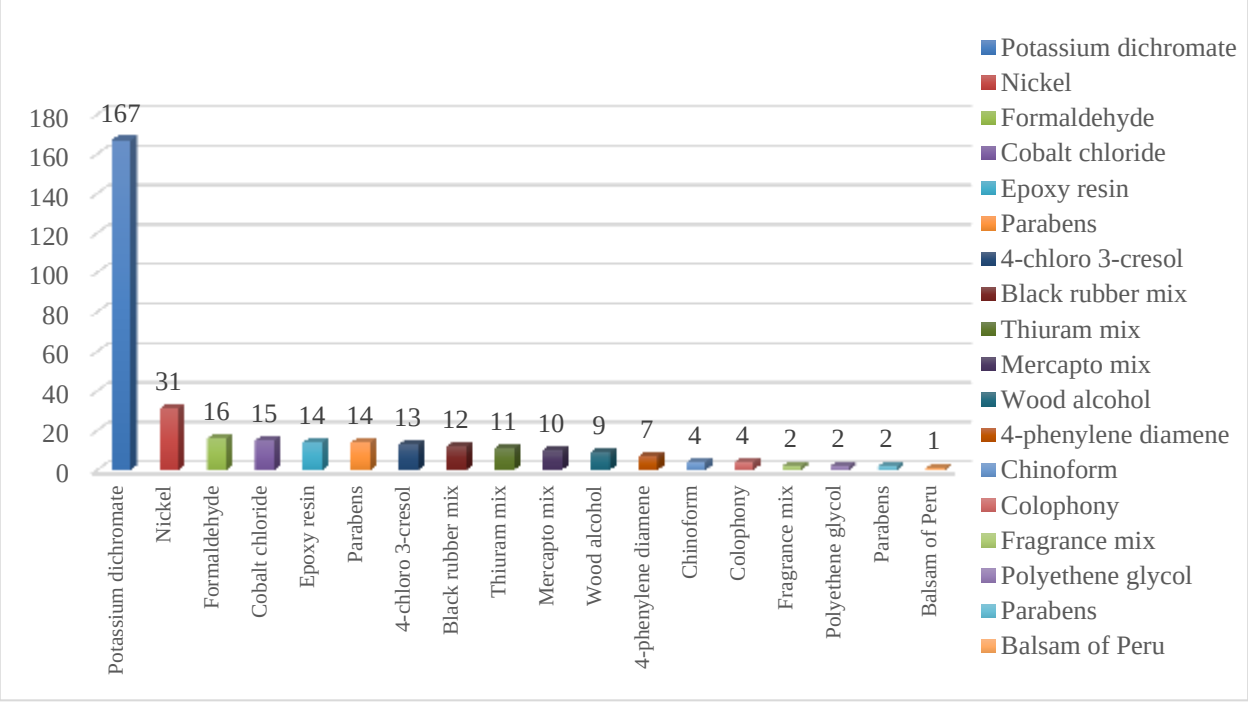


Figure 2: Incidence of allergens.

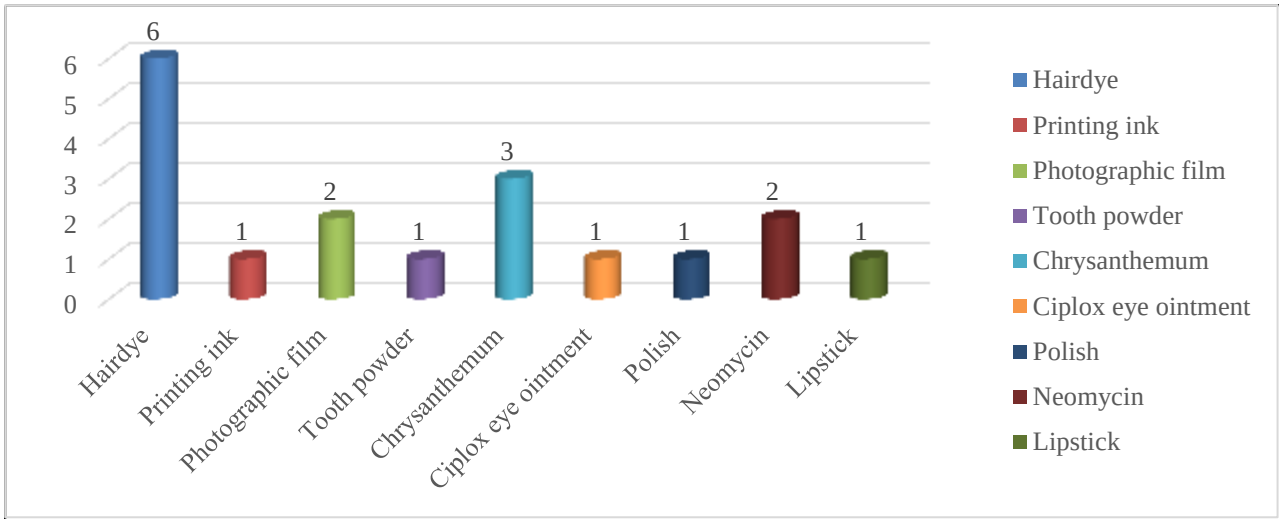


Figure 3: Incidence of other allergic substances.

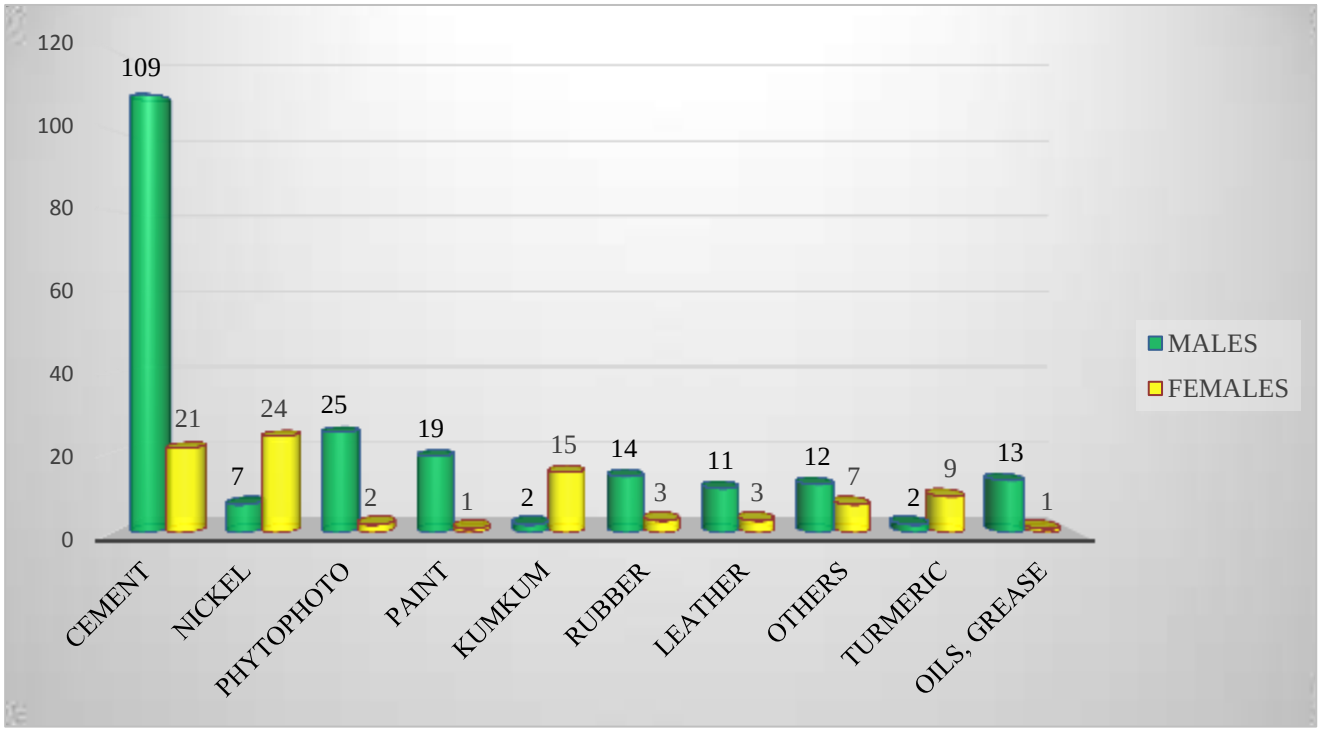


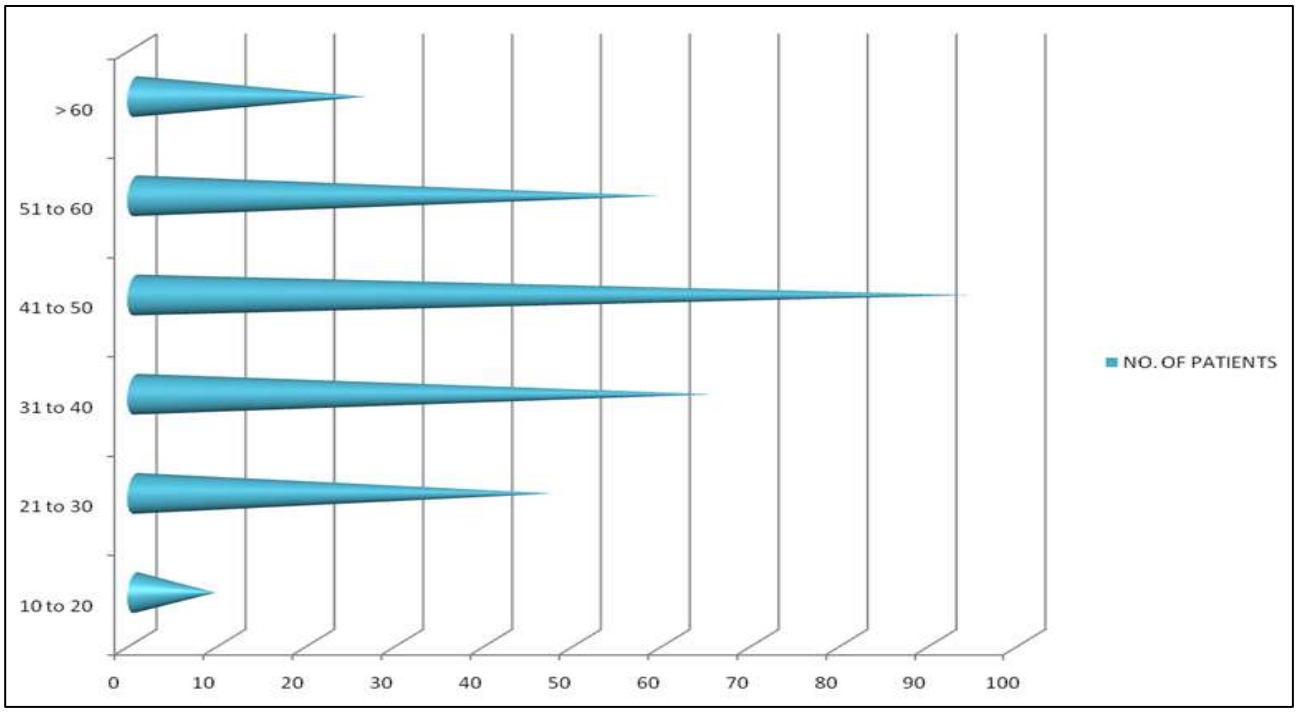
Figure 4: Sex incidence.

The commonest allergen to be tested positive was potassium dichromate (positive in 167 cases), the second common being nickel (positive in 31 cases). Formaldehyde was the third common allergen (positive in 16 cases). The next common was cobalt chloride, epoxy resin, parabens, 4-chloro 3-cresol and black rubber mix as shown in Figure 2.

Among the miscellaneous cases 6 were cases of allergic contact dermatitis to hair dyes. Other cases were allergic contact dermatitis to *Chrysanthemum*, neomycin, polish, lipstick, tooth powder, printing ink, photographic film developing fluid and eye ointment as in Figure 3.

Of the 300 cases, 214 patients were male (71.3%) and 86 patients were female (28.7%). Male to female ratio was 2.48:1. Female predominance was seen in allergic contact dermatitis to nickel, kumkum and turmeric as in Figure 4.

Most of the patients fall into the age category between 41 and 50 years of age (94 cases – 31.33%). Second most common age category was 31 to 40 years of age (65 cases – 21.67%). Third most common age group was between 51 to 60 years (59 cases – 19.67%). The youngest patient in the study was 13 years of age and the oldest was 65 years of age as in Figure 5.



Most common age group - 41 to 50 years; youngest-13 years (Cement); oldest-65 years (Parthenium).

Figure 5: Age incidence.

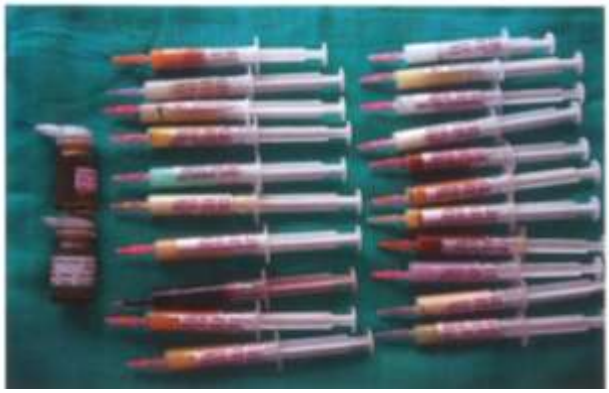


Figure 6: Allergens (Indian standard series).

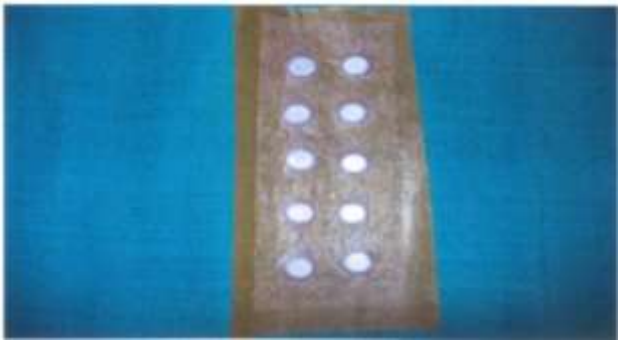


Figure 7: Aluminium chambers.

Figure 8: Contact dermatitis to cement.

Figure 9: Contact dermatitis to nickel.

Figure 10: Contact dermatitis to parthenium.

Figure 11: Contact dermatitis to kumkum.

Figure 12: Contact dermatitis to footwear.

DISCUSSION

Allergic contact dermatitis to cement was found to be the commonest in the study (43.33%). Hexavalent chromium is the most common allergen in the cement. The higher incidence of allergic contact dermatitis to cement is due to more people being employed in construction working in this part of the world. Sensitivity to chromium was demonstrated by a closed patch test with 0.5% potassium dichromate in the Indian standard series. In a similar study conducted in Mangalore, allergic contact dermatitis to cement top the list. With increasing industrialization, the construction industry provides employment to a large number of skilled and unskilled workers leading to increased incidence of allergic contact dermatitis.

Contact dermatitis to nickel was the second commonest in the study (10.33%). Nickel sensitivity was tested with 5% Nickel sulphate. Nickel in general is the most common metal causing sensitization. Nickel sensitivity was found to be more common in females compared to males with the male female ratio of 1:3.4. This is in accordance to the studies done by Nielson in a group of Danish population.[3] Jewellery and metal components of clothing were the frequent sources of Nickel in the study due to prolonged contact with the skin. Nickel salts being soluble in water and sweat easily cause sensitization. Most common substances causing Nickel sensitization in the study were necklaces, other jewellery, watches and studs in clothing. 6 out of 31 sensitive patients showed evidence of hand eczema. Studies conducted by Meding and Swanbeck support a connection between hand eczema and Nickel allergy.[4] European union Nickel directive has passed certain legislation with the intention of controlling the use of nickel releasing objects in contact with the skin. No such legislations have been passed in India.

Phytophoto dermatitis to plant allergens was the third common. Photosensitivity commonly co-exists with Compositae family allergy. Compositae plant allergy show a wide geographical variation. From India, *Parthenium hysterophorus* has been reported to be the main cause of Compositae contact dermatitis. The same finding was seen in the study too. All the patients patch tested were uniformly sensitive to *Parthenium hysterophorus* both before and after phototesting. None were sensitive to either *Chrysanthemum* or *Xanthium*. Most common pattern seen was that of airborne contact dermatitis. This pattern was also the most common in the study conducted by Sharma and Kaur.[5]

Next in the list was allergic contact dermatitis to paint. It was tested with the allergens potassium dichromate (0.5%), epoxy resins, formaldehyde and colophony. Potassium dichromate was found to be the frequent sensitizer in paints. It was in accordance to the studies done by Mathias.[6] Increasing number of cases is due to the fact that more people are being employed in construction industry in this part of the world. Cross reactivity to dichromate in cement was observed in 2 patients.

Allergic contact dermatitis to kumkum was seen in 5.7% cases and allergic contact dermatitis to turmeric was seen in 3.7% cases. Kumkum was found to be the commonest cause of cosmetic dermatitis. Common allergens in kumkum are Brilliant lake red R, Sudan I, Canaga oil and aminoazobenzene as separated by thin layer chromotography. Patch test was done with commercial kumkum as such. Due to traditional use of turmeric and kumkum by south Indian women, there is an increasing incidence of contact dermatitis.

Contact dermatitis to rubber constituted 5.7% cases. Sensitivity to rubber and its constituents was tested with black rubber mix, thiuram mix and 4-phenylene diamine in the Indian series. Rubber was found to be the commonest allergen in the footwear series. This is in

contrast to the studies conducted by Sanjib where leather was the commonest substance to cause allergy in footwear.[7] Contact depigmentation in footwear series was due to rubber. This was also seen in studies conducted by Singh and Agarwal.[8]

Allergic contact dermatitis to leather was seen in 4.7% cases. It is the second common cause of footwear dermatitis second only to rubber. Allergic contact dermatitis to leather was tested with potassium dichromate, formaldehyde, wood alcohol and 4-chloro 3-cresol. Footwear and watch straps were the common substances causing allergic contact dermatitis.

Allergic contact dermatitis to oil and grease were seen in 14 cases. Allergens in oil and grease are parabens, 4-phenylene diamine, mercaptobenzothiazole in the Indian series. Most of the patients in this group were automobile mechanics that were constantly in contact with oil and grease.

Allergic contact dermatitis to hair dye was seen in 6 cases. Paraphenylene diamine is the allergen implicated. PPD is an aniline derivative most commonly used for dyeing hair. Allergic contact dermatitis was commonly seen in beard areas and scalp was relatively spared. This was in accordance with the studies done by Foussereau.[9]

Allergic contact dermatitis to plastics was tested with formaldehyde and epoxy resin. Allergic contact dermatitis to printing ink was tested with colophony, wood alcohol, 4-chloro 3-cresol. Allergic contact dermatitis to polish was tested with colophony, polyethylene glycol, formaldehyde, potassium dichromate, parabens. Allergic contact dermatitis to Photographic film developing fluid was tested with PPD, formaldehyde and mercaptobenzothiazole.

Potassium dichromate was found to be the commonest allergen in the Indian standard series. Next in the order of the frequency are nickel, formaldehyde, cobalt chloride, epoxy resin, parabens, 4-chloro 3-cresol. The Indian standard series differs from the European standard series by the inclusion of propylene glycol, nitrofurazone, gentamycin, chlorocresol, PEG 400 and ethylene diamine chloride whereas sesquiterpene lactone mix and primin allergens are excluded. The study conducted by Narender and Srinivas in P.S.G Institute of Medical Sciences and Research showed nickel to be the most frequent sensitizer followed by potassium dichromate, cobalt chloride and colophony in that order.[1] The reason for potassium dichromate to be the commonest allergen in the study is due to the increased number of patients with allergic contact dermatitis to cement in the study.

Male to female ratio in the study of 300 cases was 2.48:1. Reason for male predominance may be due to the fact that more cases were occupational in nature where men were employed in preference to women. In the study conducted by Narender and Srinvas showed a male to female ratio of 1.8:1 and in the study conducted by Nanda et al in Mangalore the ratio was 1.27:1.[1,10] Female predominance was specifically seen in cases of allergic contact dermatitis to nickel, kumkum and turmeric. It has also been seen in the study conducted by Nielson et al.[3] It is also due to common usage of nickel and kumkum by women in this part of the world.

The most common age category of the patients was 41 to 50 years. In a similar study conducted in Iran, the mean age of the patients was found to be 43.6 years. Very young and extremes of ages were least affected. This is due to the fact that people accumulate allergies acquired over a life time and that inflammatory response is diminished in elderly patients.

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REFERENCES

1. Narendra G, SrinivasCR. Patch testing with Indian standard series. IJDVL. 2002;68:281-2.
2. Posadas SJ, Pichler WJ. Delayed drug hypersensitivity reactions—new concepts. Clin Exp Allergy. 2007;37:989–99.
3. Nielsen NH, Menne T. Allergy contact sensitization in an unselected Danish population. Acta Derm Venereol. 1992;72:456-60.
4. Meding B, Swanbeck G. Predictive factors for hand eczema. Contact Dermatitis. 1990;23:154-62.
5. Sharma SC, Kaur S. Contact Dermatitis from Compositae plants. IJDVL. 1990;56:27-30.
6. Mathias CGT. Dermatitis from paints and coatings. Dermatol Clin. 1984;2:585-602.
7. Sanjib C, Sanjay G. Epidemio-allergological study of 155 cases of footwear dermatitis. IJDVL. 2007;73:319-22.
8. Singh P, Singh J, Agarwal VS, Bhargava RK. Contact Vitiligo. IJDVL. 2003;69:27-9.
9. Foussereau J, Reutar G, Petitjean J. Hair dyed with PPD - like dyes. Contact Dermatitis. 1980;6:143.
10. Kishore Nanda B, Belliappa AD, Shetty Narendra J, Sukumar D, Ravi S. Hand eczema – Clinical patterns. IJDVL. 2005;71:207-8.

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