



## A STUDY ON CLINICAL PROFILE OF ALLERGIC CONTACT DERMATITIS AND EVALUATION OF CONTACT ALLERGEN BY PATCH TEST IN CENTRAL INDIA.

### Dermatology

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### ABSTRACT

**Background:** Amongst the various skin disorders, Allergic contact dermatitis (ACD) is one of the most common dermatoses which is very prevalent in India. The gold standard method used for diagnosis of ACD is patch testing and the main purpose of the study is to identify the common allergen responsible for ACD and to observe its spectrum of presentation. **Objective:** To study the various clinical presentation of ACD and to find out the most common allergen in the study group. **Materials and methods:** 66 cases of ACD were included in the study. Clinical profiles of all patients were recorded. The antigens of the Indian Standard Series kit (Systopic Laboratories Private Limited, New Delhi, India) were used to perform the patch testing. Removal of patches was done after 48 hours of application i.e., on Day 2 and first reading was taken 15-20 minutes later after the removal of the patches, at 96 hours (day 4) of application, a second reading was taken to observe the presence of an allergic reaction. **Results:** Patch test was found to be positive in 43.9% of cases and Potassium dichromate was found to be the most common allergen (13.6%), followed by fragrance mix (12.1%), Paraphenylenediamine (10.6%). **Conclusion:** Potassium dichromate was found to be the commonest allergen causing ACD in our study. The result of patch testing is important as it helps in educating the patient to avoid exposure to the particular allergen resulting in sustained remission from the potentially debilitating condition.

### KEYWORDS

ACD, Patch test, PPD

### INTRODUCTION

Contact dermatitis (CD) is an inflammatory response of the skin to any exogenous substance. It can be due to an irritant and/or an allergen.

Irritant contact dermatitis (ICD) is a nonspecific response of the skin to the direct chemical damage which releases certain inflammatory mediators from the epidermal cells while allergic contact dermatitis (ACD) is a delayed (type IV) hypersensitivity reaction to exogenous contact antigens. ACD accounts for approximately 20% cases of CD.<sup>[1]</sup>

Individuals with ACD have persisting, relapsing dermatitis which affects the quality of life. Patch testing is the only practical scientific procedure for diagnosing ACD. It is based on provoking skin inflammation (dermatitis) on a small skin area (less than 1 cm) under controlled conditions.

The purpose of the study is to identify the common allergen responsible for ACD in this region and to observe the various clinical presentations of the same.

### MATERIALS & METHOD

This was a cross-sectional observational descriptive study carried out in department of dermatology, Dr BRAM hospital Raipur. A total of 66 cases of ACD were included in the study. Before starting the study, approval was obtained from the institutional ethics committee. Patients who were clinically diagnosed to have ACD and willing to participate in the study & agreeing to undergo patch testing were included in the study. Patients with any other pre-existing skin disorders, who were on immunosuppressive therapy, pregnancy & lactating women, and patients who refused patch testing were excluded from the study.

### Interpretation

All reactions were graded according to the recommendation of the International Contact Dermatitis Research Group (ICDRG).

| GRADING | DESCRIPTION                                   | INTERPRETATION              |
|---------|-----------------------------------------------|-----------------------------|
| -       | No erythema or papules                        | Negative reaction           |
| 0       | Erythema only                                 | Doubtful positive reactions |
| +       | Erythema, mild infiltration, discrete papules | Weak positive reactions     |
| ++      | Erythema, infiltration, papules and vesicles  | Strong positive reactions   |

|     |                                                   |                            |
|-----|---------------------------------------------------|----------------------------|
| +++ | Intense erythema, coalescing vesicles             | Extreme positive reactions |
| IR  | Sharply demarcated erythema or epidermal necrosis | Irritant reactions         |
| NT  | -                                                 | Not tested                 |

### METHODOLOGY

A thorough history was recorded including onset, duration, site of involvement, distribution of lesion, systemic co-morbidities, any pre-existing skin diseases, seasonal variation of the disease, and occupation, Personal and/or family history of atopy was noted. Past history of similar symptoms was documented. Routine blood investigations were advised when necessary. An informed consent was taken before the procedure. The patch testing was performed in the dermatology OPD using the antigens of the Indian Standard Series kit (Systopic Laboratories Private Limited, New Delhi, India), approved by the Contact and Occupational Dermatoses Forum of India (CODFI). The allergens included are listed in Table 2

**Table 2: List of CODFI approved antigen included in the Indian Standard Battery**

| S. No. | Allergen              | Concentration |
|--------|-----------------------|---------------|
| 1.     | Vaseline              | 100%          |
| 2.     | Lanolin               | 30%           |
| 3.     | Balsam of Peru        | 10%           |
| 4.     | Formaldehyde          | 2%            |
| 5.     | Mercaptobenzothiazole | 1%            |
| 6.     | Potassium bichromate  | 0.1%          |
| 7.     | Nickel sulphate       | 5%            |
| 8.     | Cobalt sulphate       | 5%            |
| 9.     | Colophony             | 10%           |
| 10.    | Epoxy resin           | 1%            |
| 11.    | Parabens mix          | 9%            |
| 12.    | Paraphenylenediamine  | 1%            |
| 13.    | Parthenium            | 15%           |
| 14.    | Neomycin sulphate     | 20%           |
| 15.    | Benzocaine            | 5%            |
| 16.    | Chlorocresol          | 1%            |
| 17.    | Fragrance mix         | 8%            |
| 18.    | Thiuram mix           | 1%            |
| 19.    | Nitrofurazone         | 1%            |
| 20.    | Black rubber mix      | 0.6%          |

The upper portion of the back of the patient was cleaned with sterile gauze before application of the allergens. The patch test unit was marked, allergen was placed on the aluminum chambers. The patch test units were then placed on the back. Patients were instructed to keep the patch test units in place for 48 hours, avoid taking baths or wetting the area, rubbing and lying on the back, exercising, or any other activity causing sweating, using tight garments, scratching the patch test site, exposure to sunlight/UV light, and to report immediately if there is severe itching or irritation. Patches were removed after 48 hours (two days) of application and the first reading was taken 15 to 20 minutes later. A second reading was taken on day four (96 hours of application) to confirm the presence of an allergic reaction.

## RESULTS

In our study, majority of patients belonged to the fourth decade of life (39.4%), followed by the third decade (22.7%), the fifth decade (16%), the sixth decade (13.6%) & the second decade (3%). 4.5% of patients were above 60 years of age. The mean age was 38.6 years. Out of the 66 patients, 34 (51.5%) were male and the remaining 32 (48.5%) were females, with male to female ratio of 1.07:1.

A majority of the patients in our study were homemaker 28 (42.4%), followed by unskilled worker 26(39.4%), skilled worker and student 5 (7.6%) each, and white collar 2 (3%).

The commonest site to be involved in current study was the hands, in 40 (60.6%) patients, which is followed by the feet and both limb (UL & LL) in 23 (34.8%) patients each, the forehead in 5 (7.6%) patients, the neck and scalp both in 4 (6.1%) patients and the face in 2 (3%) patients.

The most common presenting complaint was itching i.e., 100% followed by scaling in 80.3% of cases, which were associated with other complaints like redness, oozing, pain, burning, etc.

Most of the patients (50%) presented to us having a duration of complaint of less than six months. This groups forms the majority. Association of atopy was detected in 0% of cases.

Upon patch testing, 43.9% of the patients showed one or more positive patch test results

**TABLE: 3**

| Allergen       | Number Of Cases | Percentage |
|----------------|-----------------|------------|
| Benzocaine     | 1               | 1.5%       |
| BRM            | 2               | 3.0%       |
| frag mix       | 8               | 12.1%      |
| NR             | 37              | 56.1%      |
| NS             | 2               | 3.0%       |
| pot dichromate | 9               | 13.6%      |
| Thu Mix        | 1               | 1.5%       |
| PPD            | 7               | 10.6%      |
| wool alcohol   | 1               | 1.5%       |
| Colophony      | 1               | 1.5%       |
| Grand Total    | 66              | 100.0%     |

In our study, Cement (13.6%) were the most common agent for ACD. The most common allergen in cement is hexavalent chromium, and the sensitivity to it was demonstrated by a closed patch test with 0.1% potassium dichromate. second common allergen causing ACD was fragrance mix (12.1%) patients. Para-phenylenediamine occupied the third place,



**ACD due to cement (potassium dichromate)**



**ACD due to PPD**



**Strong positive reactions to PPD**



**Weak positive reactions to colophony**

involving 10.6% of patients. This was followed by black rubber mix (BRM) & nickel sulphate (NS) each in 2 (3.0%) patients and benzocaine, thiuram mix, wool alcohol, colophony in 1 (1.5%) patient. Potassium dichromate, PPD, thiuram mix, BRM, benzocaine, wool alcohol and colophony were more positive in male while fragrance mix were more positive in female. In our study, nickel sulphate found to be positive in equal number of male and female patients.

## DISCUSSION

The mean age in current study was found to be 38.6 years. It was comparable to study done by Majid I,<sup>[2]</sup> & Hassan I et al,<sup>[3]</sup> where mean age was 36.79 & 40.47 respectively. Maximum number of patients belonged to 31 – 60 years age group i.e., 46 (69.7%). This could be due to the increased exposure to environmental allergens as this age group mainly constitutes the working and earning age group. Male and female are equally affected in the present study. A recent study from India showed that there was no significant difference in the sex distribution of ACD.<sup>[4]</sup> This study had 42.4% homemaker and 39.4% unskilled workers, these 2 groups were the common occupations in our study which was comparable to study done by Hassan et al where homemaker 24.7% and unskilled workers 16.5% were the common group.

Wet work occurs in a wide range of occupations, including unskilled

workers like masons and farmers as well as in household work. Water is hypotonic and acts as a cytotoxic agent on eroded skin. If the lipid from the skin surface 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 incidence of contact allergy in people involved in wet work,<sup>[5]</sup> like unskilled workers and homemakers.

None of the patient gave history of atopy in present study. This is similar to the study done by BV Kumar et al,<sup>[6]</sup> where none of the patients had history of atopy. It is generally believed that ACD is less common in persons with atopic dermatitis (AD) than in normal persons. This is thought to be due to decreased lymphocyte-mediated hypersensitivity response in atopics.<sup>[7,8]</sup>

The commonest site involved in our study was hands (60.6%), this correlate with the second most common allergen in this study i.e., fragrance mix found in detergents, soap etc. Hand eczema is the commonest of all ACD. Hand is repeatedly exposed to water or moisture which weaken the stratum corneum thereby rendering it susceptible for risky allergen and irritant. UL & LL 23(34.8%) and feet 23(34.8%), this site correspond to the most common allergen in my study i.e., potassium dichromate. Other site involved are forehead in 5(7.6%) patients, scalp & neck each 4 (6.1%) and face in 2 (3%) patients.

Patch test was positive in 43.9% of our patients. This is similar to the findings in studies by Majid I (41.4%) and Hassan I et al 38.8%) where the number of patients in whom patch test was positive was considerably less than the number in whom it was negative. Patients have chances of exposure to multiple allergen other than the allergen used for patch test in this study because of work nature and environment and all the components of various substances were not tested.

The most frequent allergen to elicit positivity in our study was potassium dichromate, which is a constituent of Leather, cement, bleaches, matches, yellow paints, fur industry, photography, electroplating, rubber, glass. This could be explained by the fact that these patients had history of exposure to cement in their occupation. Potassium dichromate was positive in studies done by Hassan I et al (16.1%) and Handa S et al,<sup>[9]</sup> (12.3%) which were consistent with our finding (13.6%). With increasing industrialization in India, the construction industry is growing fast and require a large number of workers leading to an increased incidence of ACD to cement. The second common allergen to elicit positive reactions was fragrance mix, which is a constituent of Perfumes, deodorants, laundry detergent products, toilet soap, personal hygiene products etc. Fragrance mix was positive in studies done by Majid I (8.1%) and Handa S et al (7.1%), which was close to our finding (12.1%). Fragrances are an important cause of ACD and are generally recognized as one of the five most common cause of contact sensitization. The prevalence of fragrances ranges from 5% to 14%.<sup>[10,11]</sup> This might be due to the reason that fragrances cause the hand dermatitis in an individual who had prior sensitization to perfume or in housewife's eczema this occur possibly due to cumulative insult by vegetables, fruits etc., predispose sensitivity to perfume present in soap and detergents.

PPD had shown 10.6% positivity, which is slightly higher than the studies done by Majid I (7.45%) and Hassan I et al (7.1%). These patients gave a history of using hair care products and dyes with aggravation of the symptoms on exposure. The globalization of the Indian market and easy availability of a variety of hair dyes and colors make it a potential threat for the people using it.

Nickel sulphate positivity in our study was seen in 5% of the patients which was not as high as in the other studies and was equally positive in both male and female patients. Other allergen to elicit positive result were BRM (3.0%), benzocaine (1.5%), Thu Mix (1.5%), wool alcohol (1.5%) and colophony (1.5%).

## CONCLUSION

The incidence of ACD was mostly present in the age group between 31 to 60 years indicating that it is a disorder seen among the economically productive group. Both male and female were equally affected with ACD, a recent study,<sup>[12]</sup> from India showed that there was no significant difference in the sex distribution of ACD. A higher occurrence of ACD

was observed in homemaker and unskilled workers, as they are more commonly exposed to wet works, soap, detergents & vegetables. Patch test were positive in 43.9% of our patients and potassium bichromate is the most common allergen to give positive result, followed by fragrance mix and PPD. Positive reaction to potassium dichromate was exclusively found among males likely due to occupational exposure. Fragrance mix was exclusively positive in female possibly due to more common use of cosmetics and perfumes in women. Patch test is an important tool in diagnosing the etiological agent of ACD. The interpretation of the patch test requires experience and training in considering their relevance and associating the result with the clinical findings of ACD. The Indian Standard Series has proved to be very effective and precise for the Indian population. When performed and interpreted properly patch test is the only scientific method of investigation and the only definite proof of the state of allergic sensitization.

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