

## A Clinical Study of the Role of Patch Test in Allergic Contact Dermatitis

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**Abstract:** Contact dermatitis is an inflammatory response of the skin as a result of exposure to an exogenous agent. It is divided into two main types: 1. Contact Irritant Dermatitis (CID) 2. Contact Allergic Dermatitis (CAD). The prevalence of CAD in the general population has been reported to vary from 1.5-5.4%. The aim of the present study was to evaluate the precipitating and aggravating factors in CAD and study to evaluate the results of the patch test in patients having allergic contact dermatitis. Methods: A total of 50 patients of either sex with clinically suspected contact dermatitis who attended the Out Patient Clinic of Dermatology Department of Prathima Medical College, Nagunur, Karimnagar. These patients were later subjected to a patch test after taking informed consent. The test units were thus prepared were stuck on the upper back of the patient in the vertical role in paravertebral position. Gentian violet was used for writing the numbers an occlusion of 48 hours was kept and the chambers were removed after the patient rendered to the clinic after 2 days. Results: The morphological pattern of lesions observed in Contact Dermatitis cases were Lichenification in male 40%, 18% was dry scaling 16% cases had erythema, cracking and fissuring. In female 32% had Lichenification and 22% had cracking and fissuring, dry scaling 24%, 16% each had erythema, papulovesicular and hyperpigmentation. Distribution of single and multiple antigens was studied in the patients. 76.92 % of the male had single antigen and 62.5% of the female was detected with a single antigen. Two antigens were found in 12.5% male and 4.16% female. Conclusion: Within the limitations of the present study it is concluded that contact dermatitis is very common in patients reporting to dermatology OPD. The most commonly affected were female house workers. Lichenification was the commonest morphological pattern followed by dry scaling, erythema, papulovesiculation, oozing, and depigmentation. Patch test was able to reveal the etiology in 70% of the patients. Potassium dichromate is the common sensitizer followed by Parthenium in this group of the population.

**Keywords:** Allergic Contact Dermatitis, Clinical Study, Patch Test.

### INTRODUCTION

Man is exposed to a large variety of agents in the environment; it is interesting to note each of these agents is a potential antigen, though some agents are more potent than others in causing an allergic reaction [1, 2]. Contact dermatitis is an inflammatory response of skin to an exogenous substance which may be irritant (or) allergen [3, 4]. Contact dermatitis is divided into two major types, contact irritant dermatitis (CID) and contact allergic dermatitis (CAD) both of which include contact urticaria and photo contact dermatitis. [5] CAD is due to a delayed cell-mediated allergic reaction to allergens that directly contact the skin. Most allergens in contact dermatitis are of low molecular weight (<500 Daltons) and are traditionally called "haptens" [6] Contact dermatitis is a common condition seen in up to 15% of patients attending the dermatology outpatient department. The prevalence of CD varies from 1.5% to 5.4% in the general population. It depends upon the prevailing allergens in that region and their exposure

pattern. Contact sensitivity may vary over a period of time in the same population group. Predisposing factors include certain occupations, sensitivity to some metals, the integrity of skin and chronic ulcers, prescribing patterns of physicians in the area and environmental agents like plants, fertilizers, pesticides, sprays, and insecticides. Langerhans cells are the principle antigen presenting cells in the epidermis. Together with keratinocytes, they play a major role in the activation phase of CD, while CD4 T lymphocytes play a crucial role in the elicitation phase. The clinical manifestations of the CD are due to various cytokines released depending upon nature, dose, and duration of exposure to an allergen [2].

CD is mainly classified into acute, subacute and chronic stages. A complete history of the patient is essential in establishing the etiology of the CD. The clinical picture and its distribution help to diagnose the cause in many cases. A simple and noninvasive

diagnostic procedure comment on the diagnosis of CD is a patch test. It is performed by applying the standard series of antigens along with suspected substances in appropriate concentrations to the normal skin in a standardized vehicle and the results are read after 48-72 hrs as per criteria laid down by International Contact Dermatitis Research Group (ICDRG). The treatment of CD includes avoiding of allergen responsible for dermatitis. Identification of causative allergen is not only important but becomes mandatory. Hence proper evaluation of patient reduces both suffering and economic impact in Contact dermatitis. A lot of research work has been done in many developed countries with several important research publications still there is a major lacuna in understanding the subjects such as prevalence, clinical pattern, and nature of allergen responsible of the CD [7]. Majority of Indian population lives in rural areas and agriculture is the main occupation. Rapid industrialization has taken place in recent years manufacturing a variety of commercial products [8]. Medley of traditions language custom and variety of flora are some of the factors responsible for variations in clinical pattern and etiological factors responsible for the CD. [9] Hence the present study was undertaken to focus more light on some of these aspects of the CD.

#### **MATERIALS AND METHODS**

A total of 50 patients of either sex with clinically suspected contact dermatitis who attended the Out Patient Clinic of Dermatology Department of Prathima Medical College, Nagnoor, Karimnagar. Based on History, Occupational Exposure, Hobbies and examination findings will be subjected for a patch test to detect causative allergen. The test is based on the principle that in allergic individual, the whole skin is capable of reacting with the causative agent. Therefore if the antigen is applied to the normal looking skin area, it would produce a definite dermatitis reaction.

#### **Inclusion criteria**

- Patients presenting with eczematous lesions of more than one month in whom clinical suspicion of ACD is present.
- Patients willing to undergo patch testing with informed consent for confirmation of their clinical diagnosis.

#### **Exclusion criteria**

- Other dermatological conditions resembling eczemas (psoriasis, tinea etc)
- Patients receiving systemic corticosteroids equivalent to 20 mg prednisolone or above/immunosuppressive therapy for the preceding 14 days.
- Children and pregnant women.

A detailed history of each patient was recorded in the proforma specially designed for the study

including the particulars about present complaints and duration, history of photosensitivity or photo aggravation, seasonal variation, medicaments used for pre-existing lesions atopy itself or family members, history of allergy to food, drugs or airborne agents.

A detailed occupational history including the agents used in the work environment, patients perception of the association with his CD, whether similar problems occurring in workers of the same unit was recorded. Comprehensive account items of personal use especially the cosmetics, shampoos, hair dyes, aftershave, deodorants, soaps, detergents, nail polishes and its lacquers for removal, apparels and jewelry and use of gloves was recorded and its relevance to the clinical presentation was assessed. Hobbies and part-time jobs like photographic gardening, automotive repairs, cooking, sieving, masonry or construction and painting or wood works were recorded. A complete examination was done in all patients and details about sites of involvement morphology of lesions were carefully noted down and their relevance complete history was assessed and evaluated for probable contestants in the individual patients. These patients were later subjected to a patch test after taking informed consent.

#### **Indigenous Antigens**

Additional less commonly encountered chemicals were used if an unusual contact was thought to be present on the basis of patient's history these suspected contestants had to be prepared indigenously in the suggested concentrations. Soaps and detergents were used 1% concentration aqueous solutions. Cidex (Glutaraldehyde) was used in 0.3% concentration. Aqueous vehicle. For vegetables, the pulp and juice were taken out and kept in a refrigerator at 6 -8 C and was used when required. Such antigens were kept for 6 months. Spirit, xylene and topical commercial medicaments (Desowen, Flutivate, Betnovate, and T-Bact cream) were used as such. Savlon (Chlorhexidine Solution) was used in 0.5% concentration aqueous vehicle. Hairdyes, Henna were used as such. Rests of the indigenous antigens were used as such.

#### **Application on the skin**

The test units were thus prepared were stuck on the upper back of the patient in the vertical role in paravertebral position. Any excessive hairs if the present were shaved off carefully prior to sticking the tape. Care was taken to avoid any folds on the strips. The patients were made to blend slightly and the bottom of the tape was applied first and then the tape was pressed against the skin so that the uppermost order was applied in the end. The patients were instructed to apply more strips of the tape transversally if the chambers did not adhere well and also advised not to undertake any strenuous exercise such causes excessive sweating or undertaking washing of the back.

**Skin Making and Exposure Time**

Mixing was done in numerals over the APC which was a precursor in the proforma. Gentian violet

was used for writing the numbers an occlusion of 48 hours was kept and the chambers were removed after the patient rendered to the clinic after 2 days.



**Fig-1: Patch test kit Indian standard series**

**RESULTS**

A total of 50 patients of either sex male (n=26) 52% and female (n=24) 48% with chronic eczematous lesions clinically suggestive of allergic contact dermatitis were included in the study. The results presented here are under three different headings

namely epidemiological data, clinical data and the data related to patch test. The patients were in the age group of 11 - 69 years. The maximum number of cases 44% were seen in the 20 -29 years age group followed by 16 (32%) in 30 -39 years age group and 14 (28%) shown in table 1.

**Table 1: Age and sex wise distribution of cases**

Age Group	Male	Female	Total /Percentage
11 – 19	1	0	1 (2%)
20 – 29	12	10	22 (44%)
30 – 39	8	8	16 (32%)
40 – 49	3	4	14 (28%)
50 – 59	2	1	3 (6%)
60 - 69	0	1	1 (2%)
Total	26	24	50 (100)

Most of the patients included in the study were engaged in household workers 22% followed by farmers 20%, Mason 18%, factory workers, medical and paramedical persons and the rest students, clerks, miscellaneous. The important complaints from the

patients were itching 76%, oozing 50%, cracking and fissuring 46% scaling and crusting 36% and other complaints included blistering 32%, swelling and edema pustules etc shown in table 2.

**Table-2: Distribution of CD cases according to presenting complaints (n=50)**

Complaints	No. of patients	%
Itching	38	76
Blistering	16	32
Oozing	25	50
Cracking & fissuring	23	46
pustules	4	8
Swelling & edema	1	2
Scaling & Crusting	18	36
Hyperpigmentation	14	28
Thickening of skin	16	32
ulceration	2	4
Depigmentation	1	2

Photosensitivity over lesions was observed in a few cases. The predominant sites involved among these

patients include in the order of priority in males Airborne 14%, hands 12%, hands, and feet in 12%, in

females 18% in hands, 12% on the face and 8% in hands and feet shown in table 3.

**Table-3: Distribution of CD cases according to the site involved**

Site affected	Male (%)	Female (%)
Hands	6 (12)	9 (18)
Feet	4 (8)	2 (4)
Hands and feet	6 (12)	4 (8)
Airborne	7 (14)	2 (4)
Generalized	0 (0)	1 (2)
Face	4 (8)	6 (12)
other	3 (6)	3 (6)

**Table-4: The morphological pattern of lesions observed in Contact Dermatitis**

Morphology	Male	%	Female	%
Erythema	8	16	8	16
Paulo vesicles	6	12	8	16
Oozing	1	2	0	0
Dry scaling	9	18	12	24
Cracking and fissuring	8	16	11	22
Ulceration	1	2	0	0
Lichenification	20	40	16	32
Hyperpigmentation	6	12	8	16
Depigmentation	0	0	1	2

The morphological pattern of lesions observed in Contact Dermatitis cases was Lichenification in male 40%, 18% was dry scaling 16% cases had erythema, cracking and fissuring. In female 32% had

Lichenification and 22% had cracking and fissuring, dry scaling 24%, 16% each had erythema, papulovesicular and hyperpigmentation.

**Table-5: Distribution of single and multiple sensitization CD Cases**

Single and multiple sensitizations	Male (n=26)	%	Females (n=24)	%
Single-antigen	20	76.92	15	62.5
Two antigens	4	15.38	3	12.5
Three antigens	3	11.53	1	4.16
Four or more	1	3.84	1	4.16

Distribution of single and multiple antigens was studied in the patients. 76.92 % of the male had single antigen and 62.5% of a female was detected with a single antigen. Two antigens were found in 12.5% male and 4.16% female. Four or more antigens were found in 3.84% male and 4.16% female table 5. The most common allergen found was Potassium Dichromate 22.85%, Parthenium 20.1%, Nickle sulfate, Perublastm, Chlorocresol, Thiuram Mix, Black Rubber Mix, and Garlic had 11.42%. Detergent, Cobalt Sulphate, formaldehyde and Peru balsam 2.85% and table 6.

**DISCUSSION**

Contact dermatitis is a common disorder accounting for 10-15% of all patients attending dermatology OPD. It causes considerable morbidity mainly due to recurrence of lesions, sudden flare-ups, financial and work time losses and disability due to continuous exposure to the

offending allergen. The single most important factor in the management of this condition is the avoidance of the causative allergen. Patients present with varied clinical features and the diagnosis including causative agent is usually established after careful examination of the patient and performing the patch test. It is well established in earlier studies that contact dermatitis can occur in all age groups. However, it is pertinent to note that the young adults with the mean age varying from 25 years to 41 years are predominantly affected. The preponderance of the disease in young adults is a mere reflection of the more active lifestyles of these individuals with vulnerability for exposure to multiple allergens in their environment. Contact dermatitis is seen in both males and females however minor differences have been noted in the sex distribution in various studies that have been attributed to the environmental variation between the two sexes.

Table-6: Patch test result (Indian Standard Series) (n=35)

Sl. No.	Allergen	Male	Female	Total [n=50](%)
1.	Vaseline	-	-	-
2.	Wool Alcohol	-	-	-
3.	Perublastm	-	1	1 (2.85)
4.	Formaldehyde	1	-	1 (2.85)
5.	Mercaptobenzothiazole	-	-	-
6.	Potassium Dichromate	6	2	8 (22.85)
7.	Nickel Sulphate	-	4	4 (11.42)
8.	Cobalt Sulphate	-	1	1 (2.85)
9.	Colophony	-	-	-
10.	Epoxy Resin	-	-	-
11.	Paraben Mix	2	1	3
12.	Paraphenylene Diamine	1	-	1 (2.85)
13.	Parthenium	5	2	7 (20.1)
14.	Neomycin Sulphate	-	-	-
15.	Benzocaine	-	-	-
16.	Chlorocresol	1	1	2 (11.42)
17.	Fragrance Mix	-	-	-
18.	Thiuram Mix	2	-	2 (11.42)
19.	Nitrofurazone	-	-	-
20.	Black Rubber Mix	2	-	2 (11.42)
21.	Onion	-	-	-
22.	Potato	-	-	-
23.	Garlic	-	2	2 (11.42)
24.	Tomato	-	-	-
25.	Hardner	-	-	-
26.	Detergent	-	1	1 (2.85)
27.	Hair Dyes	-	-	-
28.	Grease	-	-	-

However in the present study in both sexes are represented with slight male preponderance and a similar observation was noted by Al-Sheikh *et al.* [11] Housewives constituted a large proportion in the present study followed by the mason, clerks, medical and others. They found a high prevalence of metal sensitivity while studying CD in prefabricated construction factory workers. Zhang *et al.* [12] have found a large number of their patients being factory workers 94. Duration of contact dermatitis varies depending upon the nature of the allergen, mode of exposure and lack of awareness as noted in several studies. Sharma *et al.*; reported an average duration of 3.5 years with a range of 2 months to 10 years [13]. While Bajaj reported cases with the duration of their complaints ranging from 10 days to 7 years. 171 Contrast, the data in the present series revealed that the duration of disease from < 1 month to more than 5 years with an average of 3.5 years. Hand dermatitis was the predominant clinical pattern noted in the present study which is in conformity with other reports of Al-Sheikh *et al.* [11] However airborne contact dermatitis is the most frequently noted pattern in the series reported by Sharma and Chakrabarti [13] and they attributed it to the abundance of parthenium in and around the city. Hand dermatitis is very common in housewives because

of their frequent exposure to physical and chemical injury and excess contact with water in their environment. Airborne contact dermatitis (ABCD) is an important and rapidly expanding clinical pattern of contact dermatitis noted in certain professions such as agriculture. This feature has been noted in 60% farmers and 17% in the overall study group in the present series. Sharma SC *et al.* [14] found 59% of their patients having ABCD and they attributed this to the exposure to various plants and weeds during their occupation. Parthenium was found to be the commonest allergen in the present series. Sharma and Chakrabati [13] have similarly found it to be the commonest sensitizer in their patients and they attributed it to the abundance of this plant in and around the city. This weed was inadvertently introduced in India along with imported wheat in 1966; later it was revealed that this plant has been responsible for contact sensitivity in various parts of our country. Chromates are distributed widely and more abundantly in the environment than any other metal. People are exposed to this metal by items of daily use like leather, paints, bleaching agents, cement, gloves, shaving creams and lotions. Nickel is the ubiquitously present metal and has been held responsible for high rates of sensitization in females in various studies and this has been attributed to the

universal practice of ear piercing and contact with artificial jewelry. Al-Sheikh *et al.* [11] has seen 22.2% of their patients reacting to nickel and attributed it to the higher use of artificial jewelry in Saudi Arabia.

Medicaments are responsible for very few cases of sensitization in the present study. Nitrofurazone was responsible for some cases as reported by Sheno *et al.* [14] In our study no cases of sensitivity to Nitrofurazone, Gentamycin and Neomycin were observed. This allergen, in contrast, was found to be frequent sensitizers in the series reported by among the cosmetics, fragrance mix and hair dyes were responsible in few cases respectively. A patch test is a mainstay in establishing the diagnosis and physiological role of the suspected allergen in the CD. The percentage of positive patch test reaction with one or the other allergen in CD patients has been reported to vary from 47% to 65.5% by several authors from India and abroad. Patch test was found to be positive in 70.1% of the patients studied in the present series. The positive reaction was noted with the clinically suspected allergen in three-quarter of these patients. Minor variations in the patch test positivity with different allergens were observed in males and females by several authors including present series. Al-Sheikh *et al.* [11] have found allergic contact dermatitis more frequent in women as compared to men and they proposed that it could be due to a high rate of sensitization to certain allergens such as nickel, cobalt, and fragrances. The presence of a maximum number of patch test positive patients with hand dermatitis signifies the importance of careful evaluation of every case of hand dermatitis. The airborne pattern was seen in patients while back of the neck was involved. Airborne dermatitis was seen to the commonest pattern with patch test positivity by Sharma and Chakrabarti [13] in their study, while Al Sheik *et al.* [11] found hand dermatitis in 25.7% of their patch test positive patients. Garlic is used in almost every vegetarian or nonvegetarian South Indian family and observed to be the commonest vegetable causing sensitization in housewives with dermatitis. Similar reports have been published by Baja and Sinha *et al.* [15] have attributed this to the perennial used and potent sensitizing capability garlic when used for a longer period.

### CONCLUSION

Within the limitations of the present study, it is concluded that contact dermatitis is very common in patients reporting to dermatology OPD. The most commonly affected were female house workers. Lichenification was the commonest morphological pattern followed by dry scaling, erythema, papulovesiculation, oozing, and depigmentation. Patch test was able to reveal the etiology in 70% of the patients. Potassium dichromate is the common sensitizer followed by Parthenium in this group of the population.

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