

Patch Test Profile of Patients Attending the Contact Dermatitis Clinic of a Tertiary Care Hospital in South India: A Four-Year Retrospective Study

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Abstract

Background: Patch testing is a useful tool to detect the allergens in patients with allergic contact dermatitis (ACD). The Indian Standard Series (ISS), consisting of 20 allergens approved by the Contact and Occupational Dermatoses Forum of India (CODFI), is available in India for this purpose. **Methods:** This retrospective cross-sectional study was conducted in the outpatient department of Dermatology, in a tertiary care centre in South India, after obtaining the approval of institutional ethical and research committee. Data was collected from patch test register maintained in the department, of all patients with history suggestive of contact allergy and in whom patch testing was done with Indian Standard Series. **Results:** A total of 152 patients were included in the study out of which 86 (56.6%) were males and 66 (43.4%) were females. No statistically significant association was found between atopy and patch test positivity (P value 0.923). Among the total 152 patients included in the study, 76 patients (50%) had positive patch test to at least one allergen. In our study the most common allergen with positive patch test was potassium dichromate ($n=25$; 16.5%) followed by fragrance mix ($n=22$; 14.5%), nickel sulphate ($n=12$; 7.9%), paraphenylenediamine (PPD) ($n=11$; 7.3%), and thiuram mix ($n=10$; 6.4%). **Conclusion:** Patch testing has an important role in finding the causative allergen of contact dermatitis that otherwise becomes recurrent and chronic, requiring prolonged treatment, thereby interfering the daily activities of the individual.

Keywords: Allergic contact dermatitis; Patch test; Indian standard series

1. Introduction

Patch testing is the standard procedure used to diagnose allergic contact dermatitis (ACD) in a patient with a history of dermatitis [1]. It is a well-established method of diagnosing allergic contact dermatitis, a delayed type of hypersensitivity reaction. It reveals the prevalence and trends of contact sensitization in the community there by paving the way for better standard series. Educating the patient about the avoidance of allergen and providing suitable alternatives are very important in

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the management of ACD [2]. The Indian Standard Series (ISS), consisting of 20 allergens approved by the Contact and Occupational Dermatoses Forum of India (CODFI), is available in India for this purpose [3]. The present study is being undertaken to identify the common allergens in local population who have presented to our OPD with clinical diagnosis of allergic contact dermatitis who were tested with a set of allergens in the ISS.

2. Materials and Methods

This retrospective cross-sectional study was conducted in the outpatient department of Dermatology, in a tertiary care centre in South India, after obtaining the approval of institutional ethical and research committee. Data was collected from patch test register maintained in the department, of all patients with history suggestive of contact allergy and in whom patch testing was done with Indian Standard Series (TABLE 1) between October 2016 to October 2020.

TABLE 1. List of antigens in Indian standard series.

SL NO	ALLERGEN
1	Vaseline
2	Wool alcohol
3	Peru balsam
4	Formaldehyde
5	Mercaptobenzothiazole
6	Potassium dichromate
7	Nickel sulphate
8	Cobalt sulphate
9	Colophony
10	Epoxy resins
11	Paraben mix
12	Paraphenylenediamene
13	Parthenium
14	Neomycin sulphate
15	Benzocaine
16	Chlorocresol
17	Fragrance mix
18	Thiuram mix
19	Nitrofurazone
20	Black rubber mix

History regarding age, sex, occupation, presenting complaints and duration, aggravating factors, and association with atopy was obtained from the patch test register. History regarding contact with routinely used chemicals, vegetables, colouring agents, dyes, gloves, and medicaments was noted. Clinical examination findings and patch test reading were recorded.

The modified Finn chamber method which consists of circular aluminium chambers, on an acrylate-based adhesive was used. Marking was done in numerals with skin marking pencil. The patch test kits were applied over the back in vertical rows starting from the left scapular region for a period of 48 hrs. Patients were advised to avoid wearing tight clothes, excessive exercise, rubbing, scratching or wetting the area. The patch test units were removed after 48 hrs (D2) and readings were taken half hour after removal, so as to allow the transient erythema caused by the occlusive effects of allergens and plaster to subside. Photopatch testing and reading at day 3 and 7 were not done. Patch test results were interpreted using the criteria laid down by the international contact dermatitis research group (ICDRG) (TABLE 2).

TABLE 2. The international contact dermatitis research group (ICDRG) system for clinical scoring of allergic patch test reactions.

(-)	Negative
(+/-) or (?)	Doubtful reaction; faint macular erythema only
(+)	Weak positive reaction (erythema, infiltration and discrete papules)
(++)	Strong positive reaction (erythema, infiltration, papules and vesicles)
(+++)	Extreme positive reaction (intense erythema, infiltration and coalescing vesicles)
(IR)	Irritant
(NT)	Not tested

All the data collected from patch test registers were coded, verified, and entered into MS EXCEL sheet. Statistical analysis was done using Statistical Package for Social Sciences SPSS version 24. Descriptive statistical tools like frequency, percentage was used. For comparison, inferential statistical tool - Spearman's correlation coefficient was used. *P* value <0.05 was considered significant.

3. Results

A total of 152 patients were included in the study out of which 86 (56.6%) were males and 66 (43.4%) were females. The age of patients ranged from 18 years to 80 years with a mean age of 41.66 years. Majority of patients were home makers [n=53 (34.9%)] followed by construction workers [n=37 (24.3%)] and students [n=12 (7.9%)]. Thirty-seven patients had history of atopy (24.3%). No statistically significant association was found between atopy and patch test positivity (*P* value 0.923). The predominant symptom was itching (86.8%) followed by burning sensation (13.2%).

Most of them were presented with scaling [n=125 (82.2%)]. Erythema, papules and plaques, erosion, fissuring and lichenification were the other manifestations. The predominant site of involvement was upper limb (87.5%). Among the study population, detergent was the most commonly used contact allergen [n =85 (55.9%)] followed by cement and vegetables.

Among the total 152 patients included in the study, 76 patients (50%) had positive patch test to at least one allergen. Among this, 41 (27%) were positive for single allergen only and 35 (23%) patients had positive patch test reactions to multiple allergens. Among those with multiple allergies, 18 patients had allergy to two antigens and 17 patients showed positivity to more than two allergens.

In our study the most common positive allergen was potassium dichromate (n=25;16.5%) followed by fragrance mix (n=22; 14.5%) nickel sulphate (n=12; 7.9%), paraphenylene diamine (PPD) (n=11; 7.3%), and thiuram mix (n=10; 6.4%). The complete list of positive allergens is shown in FIG.1. All patients with positive fragrance mix allergy (n=22) had contact with either soap or detergents. Out of 25 patients with positive patch test to potassium dichromate, majority (n=20; 80%) had history of cement as aggravating factor, which was statistically significant ($p<0.01$). Among this, 16 were construction workers.

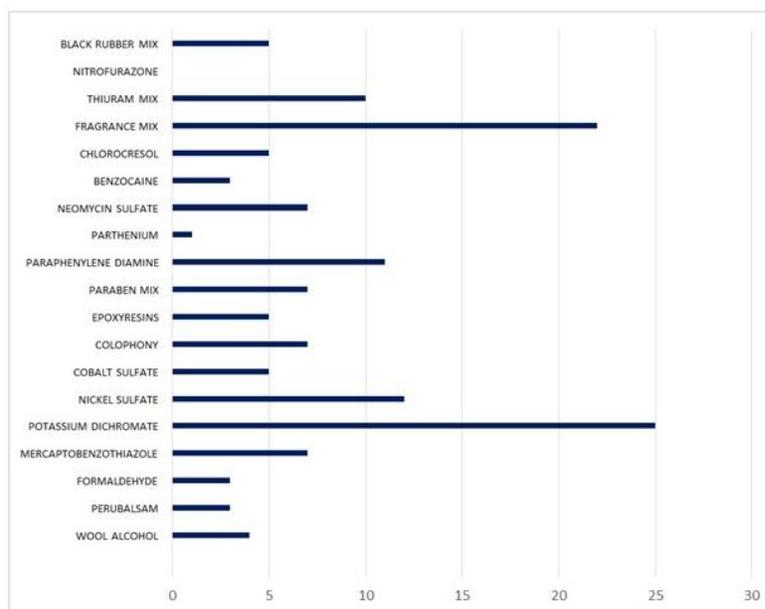


FIG. 1. Results of patch testing.

4. Discussion

Contact dermatitis is a chronic disorder and may result in considerable physical and occupational morbidity, besides causing significant psychosocial embarrassment. The genetic constitution of individuals is an important risk factors for development of ACD. Customs and traditional practices can cause dermatitis in uncommon sites and patterns [4]. Ethnically, darker races have a lower risk for ACD, because of the higher barrier function for certain substances [5]. Patch test plays a central role in diagnosis of allergic contact dermatitis. It has a sensitivity and specificity of between 70% and 80%. In this study, patients who underwent patch test with Indian Standard Series for suspected allergic contact dermatitis were included.

In the present study, 71.7% of the total patients were between 18 to 50 years of age. This is in concordance with the study by Bajaj et al where most of the cases (60%) were between 21 to 50 years. Also, the median age of patients was 40 years in our study which was similar to the study by Bajaj et al (35.9) and Hassan et al (34.7) [6,5]. Preponderance of allergic contact dermatitis in young adults may be due to their more active lifestyles resulting in frequent exposure to various irritant and allergens in the environment.

A male preponderance of allergic contact dermatitis was there in our study (56.6%). Kumar et al, Barauhet al and George et al also reported a similar observation [7-9]. Some other studies report female preponderance also [5]. More male patients were ready for regular follow up readings of patch test when compared to females. Overall increased incidence in males could be

due to increased exposure to various allergens as they are more involved in outdoor activities.

Contact dermatitis occurs more in certain high-risk occupations like homemakers, masons, farmers etc. In our study, majority of patients were home makers [n=53 (34.9%)] followed by construction workers [n=37 (24.3%)] and students [n=12 (7.9%)]. In other published studies the major occupation groups were skilled labourers, home makers and manual labourer [10]. Higher incidence among homemakers can be attributed to constant trauma from heat and fire along with exposure to chemicals used frequently for washing, cooking and cleaning purposes. Construction workers like masons constituted the second most important group in our study, which can be attributed to repeated exposure to major allergens like chromates in cement.

It is a general concept that people with atopic diathesis are more prone to develop allergic contact dermatitis as suggested by previous studies [11]. In our study, thirty-seven patients had history of atopy (24.3%) and no statistically significant association was found between atopy and patch test positivity.

thirty-seven features of contact dermatitis may vary from minimal patchy dermatitis to widespread involvement of limbs. In our study, itching was the commonest presenting complaint (86.8%). The common morphological presentations were scaling (82.2%) followed by erythema (17.8%) and hyperpigmentation (17.8%), fissuring (11.2%), papules (7.2%), lichenification (5.9%) and vesicles (5.3%). Similar findings were reported in previous studies also [7].

The clinical pattern and site of contact dermatitis varies in different individuals depending upon the allergen exposure and extent and duration of the disease. Out of the total 152 patients, majority [133 (87.5%)] presented to us with a pattern of hand dermatitis. Contact dermatitis of hands is an important health problem in the work environment and people from varied socioeconomic backgrounds and professions are affected. This has been attributed to the repeated trauma while handling physical and chemical allergens [12]. Other common areas of body affected were foot (50.7%), trunk (14.5%) and face (7.2%). Hand dermatitis was the common pattern of contact dermatitis in studies by Hassan et al and Mehta et al also [5,13].

In the present study, 76 out of total 152 patients (50%) showed positive patch test response to at least one allergen in the battery. This was similar to the observation by Bajaj et al where 59% patients showed atleast one patch test positive [6]. Kumar et al (57%) and Mehta et al (51.33%) also recorded similar incidence of patch test positivity in their studies [7,13]. Krupashankar et al conducted a study to detect contact sensitization in psoriasis patients and among 110 subjects, 47 (42.7%) showed reactions to at least one antigen, which was lower than that in our study [14]. Among the positive patients in our study, 41 (27%) were positive for single allergen only and 35 (23%) patients had positive reactions to multiple allergens. 18 (11.8%) patients had allergy to two antigens and 17 patients showed positive reactions to more than two allergens. Notably, two patients showed allergy to five test substances each.

Multiple patch test reactions may occur due to nonspecific hyperreactivity, multiple primary hypersensitivities, or cross-reactions. Multiple primary hypersensitivities to chemically unrelated substances are common among patients with contact dermatitis. Cross-sensitization is defined as the phenomenon where sensitization caused by one compound extends to one or more other compounds due to structural resemblance [7].

In our study the most common allergen with positive patch test was potassium dichromate (n=25; 16.5%) followed by fragrance mix (n=22; 14.5%), nickel sulphate (n=12; 7.9%), PPD (n=11; 7.3%), and Thiuram mix (n=10; 6.4 %). Kumar et al reported potassium dichromate as the most common allergen followed by nickel sulphate in their study of 80 patients [7]. In the study by Bajaj et al also, nickel and potassium dichromate were reported to be the common culprits among the 1000 patients tested [6]. Most common allergens in the study by Hassan et al and Dorjay et al were nickel sulfate followed by potassium dichromate [5,15]. Parthenium, fragrance mix, and potassium dichromate were the common allergens in another study by George et al. [9]. Potassium dichromate was the predominant allergen among male and nickel among female in the study by Kumar et al. [7] (TABLE 3).

TABLE 3. Comparison of common allergens with previous studies.

Common allergens	Present study	Keragala et al. [1]	Jindal et al. [3]	Bajaj et al. [6]	Kumar et al. [7]	Dorjayet al. [15]
Potassium dichromate	16.5%	7.1%	3%	11.1%	35.3%	11%
Fragrance mix	14.5%	-	15%	5.5%	14.7%	8%
Nickel sulphate	7.9%	16%	9%	12.9%	23.5%	16%
Paraphenylene diamine	7.3%	12.3%	15%	5.3%	-	6%
Thiuram mix	6.4%	5.9%	3%	3.3%	2.94%	-

We made an attempt to correlate the patch test positive results with the components of allergens. A significant correlation was seen between suspected cement allergy with potassium dichromate positivity and suspected soap/detergent allergy with fragrance mix positivity. The frequency of potassium dichromate positivity can be attributed to the high percentage of construction workers in our study. Possible sources of exposure to chromates included use of cement, leather, matches, bleaches, yellow paints, varnishes, glues, soap, and detergents, and cleaning products [7]. In India, chrome-free leather is not much in use due to its high cost. In Western countries they add ferrous sulfate to cement, which converts the easily absorbable hexavalent chromium to the less-sensitizing trivalent form [8]. The more number of positive reactions to fragrance mix could be due to increased use of cosmetics, toiletries, and skin care products. Nickel is present universally in the environment. Early development of nickel sensitivity in our population could be due to the frequent use of nickel-plated jewellery and accessories like spectacle frames, belt buckles, pins, clips, zippers, coins, and keys. These jewellery items and other accessories may release nickel [7]. The most common source of PPD in our study was usage of hair dyes. Parthenium, although is an important allergen in whole of India, was positive only in one patient in our study.

The limitation of this study was lack of follow-up after informing patients regarding allergen avoidance. Also, “as is” testing for suspected items was not done in our study. Day 7 reading was not taken, and in none of the patients, a photopatch test was done.

5. Conclusions

Patch testing has an important role in finding the causative allergen of contact dermatitis that otherwise becomes recurrent and chronic, requiring prolonged treatment, thereby interfering the daily activities of the individual. Hence, patch testing must be done for all cases of suspected contact allergy and patients have to be taught regarding the cautious use or avoidance, if possible, of the daily objects containing identified culprit allergens. Having a knowledge about the common allergens in a demographic area helps the treating clinician in finding out the etiological factors easily. In this era of urbanization and cosmetics, it is necessary to patch test every suspected patients with ACD.

6. Conflict of Interest

Nil.

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