



## Original Research Article

## Study of etiopathogenesis of air borne contact dermatitis

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## ABSTRACT

Airborne contact dermatitis is an acute or chronic dermatoses predominantly affecting exposed parts of the body and caused by allergens/irritants present in the atmosphere. The agents commonly responsible for this type of dermatitis are either the plants or the industrial agents. This study was carried out on patients with a clinical picture and history consistent with air born contact dermatitis (ABCD) due to exposure to Parthenium hysterophorus (parthenium weed), chrysanthemum, xanthium who were patch tested.

**Materials and Methods:** This prospective study was conducted in Department of Rural-Cum-Industrial Skin & Health Institute, Dasna, Ghaziabad District, New Delhi. A total of 100 patients suspected to be suffering from ABCD included. A detailed clinical history, cutaneous and systemic examination was done. All patients were patch tested for allergens (parthenium hysterophorus, chrysanthemum, xanthium). Patch test was carried out for Parthenium, Chrysanthemum and Xanthium. All 100 suspected patients were patch tested with dried leaves and flowers of plants, and with standard battery of antigen consisting mainly of antigens for Parthenium, chrysanthemum and xanthium. Patients were instructed to avoid wetting the site, exercise, rubbing and scratching for 96 hours.

**Results :** In the present study, out of 100 patients 94 patients showed positive reaction to either parthenium, chrysanthemum or xanthium plant antigens. While 6 did not show positive reaction to any plant antigens. In this study, majority of the patients were belongs to geriatric age group and from urban areas. In our study, 82 patients tested positive for Parthenium, 9 patients tested positive for Chrysanthemum, 3 for Xanthium and 6 for other chemicals. In addition to this, 10 patients were atopics and others skin condition was normal. 14 (14%) patients had previous history of drug intake in the form of Hospitalization (Non-steroidal Anti-inflammatory Drugs), chronic illness, following accidents. 15% showed good hygiene and 85% showed poor Hygiene.

**Conclusion:** The present study, 82 patients tested positive for Parthenium, 9 patients tested positive for Chrysanthemum, 3 for Xanthium and 6 for other chemicals. Parthenium dermatitis may changes to mixed pattern or chronic actinic dermatitis (CAD). Parthenium dermatitis may be common once.

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## 1. Introduction

Air Borne Contact Dermatitis (ABCD) is the term used for patients having Contact Dermatitis due to the agents suspended in the air and settling on the exposed parts of the body. Airborne contact dermatitis is an acute or chronic dermatoses predominantly affecting exposed parts of the body and caused by allergens/irritants present in the

atmosphere.<sup>1</sup>

The agents commonly responsible for this type of dermatitis are either the plants whose components such as pollen, trichomes or dry leaf fragments can get airborne, or the industrial agents which pollute the air from the factories.<sup>2</sup>

Allergens can be present in the form of dust, sprays, pollen, volatile chemicals by airborne fumes or droplets, which settle on the exposed skin of the body. Airborne contact dermatitis is a dermatoses affecting mainly exposed

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parts of the body and is caused by allergens/irritants present in the atmosphere. Allergens can be present in various forms like dust, sprays and pollens, which settle on the exposed parts of our body.<sup>3</sup>

Most commonly affected sites are face, neck, 'V' area of chest, eyelids, axillae and forearms. Sometimes non exposed sites like major body folds can also be involved. Airborne contact dermatitis can be of both plant and non-plant origin.<sup>4</sup> Most common airborne dermatitis is due to compositae plant *Parthenium hysterophorus*.<sup>1</sup>

According to a classification by Dooms - Goossens, airborne contact dermatitis can be divided into five different types.<sup>5</sup>

1. Airborne irritant contact dermatitis
2. Airborne allergic contact dermatitis
3. Airborne phototoxic reactions
4. Airborne photoallergic reactions
5. Airborne contact urticaria

Commonly responsible agents are disseminated in the atmosphere in the form of droplets Eg: Sesquiterpene lactones, naturally occurring contact allergens in various plant families, including the compositae are by far the most frequently described airborne allergens in weed dermatitis. Other examples: sprays such as insecticides, perfumes and hair spray are also responsible agents. Dispersion of gas in the atmosphere. Eg: very volatile substance such as formaldehyde, dimethylthiourea that can be made volatile by an increase in temperature.<sup>6</sup> This study was carried out on patients with a clinical picture and history consistent with ABCD due to exposure to *Parthenium hysterophorus* (*parthenium* weed), *chrysanthemum*, *xanthium* who were patch tested.

## 2. Materials and Methods

This prospective study was conducted in Department of Rural-Cum-Industrial Skin & Health Institute, Dasna, Ghaziabad District, peripheral center of Skin Institute and School of Dermatology, New Delhi. A total of 100 Patients suspected to be suffering from Air Borne Contact Dermatitis were included in the study. Of these 100 patients, 66 were males and 34 females. The age of the study subjects ranged from 28 years to 80 years. Of these, the study included more of geriatric age group 60-80 years. The patients were from rural and sub urban/urban background who presented to the outpatient Department. The patients presenting with Dermatitis of exposed parts especially those with a seasonal variation were investigated.

A detailed clinical history of each case was recorded with special emphasis on occupation, kind of exposure to allergens, hygiene, previous history of atopy, Asthma, Hayfever, previous history of drug intake, hospitalizations, chronic illness, accidents, seizures etc. Cutaneous and systemic examination was conducted and findings were

noted as per the protocol. Besides routine haematological tests, all patients were patch tested for allergens (*parthenium hysterophorus*, *chrysanthemum*, *xanthium*).

Patch test was carried out for *Parthenium*, *Chrysanthemum* and *Xanthium*. In some cases the patients were asked to get the suspected antigen themselves. In few cases we undertook a visit to the place of work/exposure of the patients to get firsthand knowledge of the nature of exposure. During the visit, suspected allergens were picked up from the site itself. Each subject has given informed consent to undergo patch test.

All 100 suspected patients were patch tested with dried leaves and flowers of plants, and with standard battery of antigen consisting mainly of antigens for *Parthenium*, *chrysanthemum* and *xanthium*.

Patients were instructed to avoid wetting the site, exercise, rubbing and scratching for 96 hours.

### 2.1. Patch Test

Patch test is the only scientific proof of airborne contact dermatitis, allergic contact dermatitis provided it is properly performed and correctly interpreted.

The patch test was first devised by Jadassohn in 1896 and later brought into general use by Bloch. Before performing patch test the following principles were followed. (a) Test site was completely cleared of active dermatitis. (b) Systemic corticosteroids were stopped prior and during the test. (c) Potent topical steroids at the test site was avoided for a couple of days prior to the test. (d) Immunosuppressive drugs were avoided for 3 weeks prior to the test.

### 2.2. Technique

Finn Chambers and other readymade materials were used. The same can be prepared easily. Approximately 2 cms square sized 4 layered gauze piece was stuck to 3.5 cms square adhesive tape. 1 cms square sized piece of Whitman No. 1 filter paper is placed at the centre of gauze piece. If there is a history of allergy to ordinary adhesive tape, then Hypo allergenic micropore type is used. These tapes being less adhesive, there are chances of them being removed. The sticking plaster keeps the antigen in position and acts as an occlusive layer. The gauze piece inbetween separates the reaction produced by antigen and the plaster. The allergens are applied to the filter paper either as 2 drops of liquid vehicle allergen mixture or petrolatum allergen mixture dispensed from 2 ml plastic syringe. Solid allergen can be finally powdered and mixed with 1 to 2 drops of water.

Patches are applied either on upper back or lateral half of upper arm, the site is cleaned with ordinary tap water as soap solution or spirit may irritate the skin. In hairy subject the site was gently shaved prior to application of patches. During application of patches on upper back the patient was asked to sit erect which would prevent loosening of

patch later on. The patches were applied either in vertical or horizontal row leaving 1 inch area on either side of vertebral column. The patches were numbered serially and accurate records of test antigens were kept in a register.

The patches were kept in place for 48 hours but if there was burning; oozing or unbearable itching in any of the patch then that patch was removed carefully without disturbing the others. After 48 hours patches were removed marking the number on the adjoining skin. The area was cleaned with water. The patients were asked to wait for half an hour which is required for the skin to recover from the pressure effect of the patch.

### 3. Results

In the present study, 100 suspected patients of ABCD constituted subjects of our study. Out of 100 patients 94 patients showed positive reaction to either parthenium, chrysanthemum or xanthium plant antigens. While 6 did not show positive reaction to any plant antigens, (4 patients showed positive reaction to formaldehyde, 2 patients did not show any reaction to plant allergens and standard batter).

In this study, majority of the patients were belongs to geriatric age group as represented in table 1. Majority of the subjects were from urban areas as illustrated in table 2 and duration of the disease was depicted in table 3. Clinical characteristics were shown in table 4. In our study, 82 patients tested positive for Parthenium, 9 patients tested positive for Chrysanthemum, 3 for Xanthium and 6 for other chemicals as reported in table 5 and Figures 1, 2 and 3 shows Parthenium Leaf and Flower, Chrysanthemum respectively. Figure 4 shows the air born contact dermatitis involving the face. In addition to this, 10 patients were atopic and others skin condition was normal. 14 (14%) patients had previous history of drug intake in the form of Hospitalization (Non-steroidal Anti-inflammatory Drugs) chronic illness, following accidents. 15% showed good hygiene and 85% showed poor Hygiene.

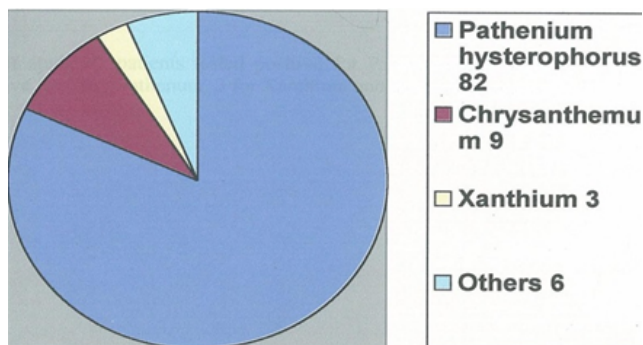


Fig. 1: Patch test with plant extracts in suspected ABCD population



Fig. 2: Parthenium Leaf and Flower



Fig. 3: Chrysanthemum

### 4. Discussion

The present study was conducted on 100 suspected patients of ABCD subjects. In the present study, 100 suspected patients of ABCD constituted subjects of our study. Out of 100 patients 94 patients showed positive reaction to either parthenium, chrysanthemum or xanthium plant antigens. While 6 did not show positive reaction to any plant antigens, 4 patients showed positive reaction to formaldehyde, 2 patients did not show any reaction to plant allergens and standard batter.

In India, *P. hysterophorus* is the most common cause of plant dermatitis. It classically causes airborne contact dermatitis. In acute form, airborne dermatitis is characterized by dermatitis involving the face and flexural areas, such as sides of the neck, cubital and popliteal fossae.<sup>6</sup> Parthenium and other compositae are known to

**Table 1:**

+/-	Doubtful reaction	Faint erythema only
+	Weak positive reaction (Non vesicular)	Erythema infiltration and possibly discrete papules.
+f	Strong positive reaction (vesicular)	Erythema, infiltration, papuler & vesicles
+++	Extreme positive reaction (bullous)	Intense erythema, infiltration, and coalescing vesicles.
-	Negative reaction	
IR	Irritant reaction.	

**Table 2:** Age and Sex Distribution of study subjects

Age (Years)	Male	Female	Total
1-19	0	0	0
20-39	2	10	12
40-59	14	6	20
60-80	50	18	68
Total	66	34	100

**Table 3:** Urban / Rural Distribution of subjects

	Male	Female	Total
Urban	13	9	22
Rural	53	25	78
Total	66	34	100

**Table 4:** Duration of the Disease

Duration (years)	Male	Female	Total	Percentage
1-5	22	20	42	42%
6-10	26	11	37	37%
11-15	12	2	14	14%
16-20	6	1	7	7%
Total	66	34	100	100%

**Table 5:** Clinical Characteristics with suspected ABCD

Clinical Characteristics	Male	Female	Total	Percentage
<b>Mode of exposure</b>	50	26	76	76%
a) Direct exposure Occupational Gardening	9	2	11	11%
b) Indirect exposure (environmental)	8	5	13	13%
Seasonal Variation	49	31	80	80%
Photo-aggravation and/ or Photo Sensitivity	52	21	73	73%

**Table 6:** Sex distribution in patch test

Plant Extracts	Positive Patch Tests		Total	Percentage
	M	F		
Parthenium Hysterophorus	51	31	82	82
Chrysanthemum	6	3	9	9
Xanthium	3	0	3	3
Formaldehyde	4	0	4	4
Negative	1	1	2	2



**Fig. 4:** Air born contact dermatitis involving the face.

cause dermatitis resembling photosensitivity. In a study conducted by Tiwari et al. reported that photosensitivity pattern in 28% of their 50 cases of allergic contact dermatitis due to *P. hysterophorus*.<sup>7</sup> Shenoy and Srinivas reported changing pattern of parthenium dermatitis in 9 of 30 patients. All the 9 patients had dermatitis in a photopattern, of whom 4 had lesion only in sun-exposed areas, whereas 5 also had minimal involvement of flexural and shaded areas.<sup>8</sup>

Sharma et al conducted a study by including 74 patients (49 men and 25 women) of parthenium dermatitis with an age range of 22–70 years. 60 patients had ABCD, 5 patients had mixed pattern, and 9 patients had chronic actinic dermatitis (CAD) pattern at the onset. Of the 60 patients with ABCD, 27 changed to CAD pattern and 11 changed to mixed pattern after an average period of 4.2 years. They suggested that the clinical pattern of parthenium dermatitis undergoes a significant change after the onset, i.e. progresses from airborne ABCD to mixed pattern or CAD pattern.<sup>9</sup>

Bell and Johnson in their series of 55 cases with Photosensitivity dermatitis/actinic reticuloid syndrome (PD – AR) observed contact sensitivity to compositae plant extract in 47 patients. *P. hysterophorus* produced reaction in 30 of 38 tested and *Xanthium strumarium* in 20 of 25 patients patch-tested.<sup>10</sup> In a study by Menage et al. reported 36% patch test positivity to sesquiterpene lactone (SL) mix

in 89 patients with CAD.<sup>11</sup>

## 5. Conclusion

In the present study, 82 patients tested positive for Parthenium, 9 patients tested positive for Chrysanthemum, 3 for Xanthium and 6 for other chemicals. Parthenium dermatitis may changes to mixed pattern or CAD. Further studies are recommended.

## 6. Conflict of interest

None.

## 7. Source of Funding

None.

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