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Clinico-Demographic Profile of Patients with Foot Dermatitis: A Cross-Sectional Study with Special Reference to Patch Test Results

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Abstract

Background:

Foot dermatitis is a common debilitating dermatological disorder where the eczematous process predominantly involves the feet.

Aims and Objectives:

To analyze the clinico-demographic profile, type, clinical pattern, and evaluate the role of patch testing to determine the causative factors of foot dermatitis.

Materials and Methods:

Fifty-eight new patients clinically diagnosed with foot dermatitis were subjected to detailed history taking and physical examination. The patients were subjected to patch testing using the Indian standard battery and Indian footwear series (Contact and Occupational Dermatoses Forum of India [CODFI]).

Results:

Among the 58 patients (mean age 31.48 ± 16.4 years, M:F 1:1.2), the majority (39.7%) presented with allergic contact dermatitis (ACD) followed by irritant contact dermatitis (ICD) (19%), while atopic dermatitis was the least (3.45%). However, 48% of our patients reported a history of atopy. About 43.5% of ACD patients showed a positive patch test reactions to at least one allergen of Indian standard battery and footwear series. Mercaptobenzothiazole (MBT) was the commonest allergen (50%), followed by potassium dichromate (40%), thiuram mix (20%) while paraphenylenediamine was the least common

(10%). Dorsum of the foot was affected most commonly (55.17%), followed by toe (46.55%) and sole (41.38%). Scaling was observed in almost 80% of patients followed by crusting. Housewives were affected most commonly followed by students and cement workers.

Conclusion:

Rubber and rubber chemicals were found to be the commonest allergen inciting foot dermatitis. Atopy might be a predisposing factor in these patients. Thus, patch testing is recommended to determine the cause of foot dermatitis and provide suitable treatment.

KEY WORDS: *Atopy, foot dermatitis, patch test*

Introduction

Foot dermatitis is one of the common and debilitating dermatological disorders with an eczematous process predominantly involving the feet. Dermatitis represents the cutaneous response to a wide range of endogenous or exogenous factors (physical/toxic effects of a variety of environmental exposures characterized by erythema, vesiculation, and oozing in the acute phase; while its chronic phase is characterized by dryness, lichenification, scaling, and fissuring).^[1]

Contact dermatitis is a common skin ailment accounting for about 4%-7% of all dermatological consultations;^[1] allergic contact dermatitis (ACD) being an important variant, which is essentially a cell-mediated hypersensitivity reaction induced by certain environmental allergens following prior sensitization. This variety predominantly affects the hands, feet, and face.^[2] In most cases, foot dermatitis follows a chronic waxing and waning course showing a poor therapeutic response. To date, a plethora of allergens causing foot dermatitis have been identified. The inability to identify the causative allergen in many of the cases restricts the proper implementation of preventive measures, thus, rendering all symptomatic treatments minimally effective. A patch test may be employed to determine the causative allergens in these refractory cases in order to devise a better management strategy.^[3] Besides, there are several other predisposing factors that also need to be assessed to address this problem.

This study was conducted to assess the clinico-demographic profile of foot dermatitis, to analyze the different predisposing factors, and to evaluate the role of patch testing in determining the causative allergens.

Materials and Methods

We conducted a cross-sectional study involving 58 new patients of clinically diagnosed foot dermatitis attending our dermatology outpatient department over a period of 18 months after obtaining approval from the institutional ethics committee and proper informed consent from the patients. The exclusion criteria included patients denying consent, immunosuppressed patients (drugs/disease), and pregnant/lactating females.

A detailed history of each patient was taken with special emphasis on demographic profile, age at onset, site of initial lesion, seasonal variation, the role of aggravating factors, medications used for preexisting lesions, and personal or family history of atopy. The patients were also enquired about their occupation and hobbies and pattern of usage of footwear. Associated symptoms such as pruritus, pain, dryness, scaling, redness, and oozing were also recorded. A thorough clinical examination was also performed to assess the distribution and nature of lesion [\[Figure 1\]](#). Routine hematological and urine investigations were performed. Skin scrapings for fungus were done to rule out fungal infection in doubtful cases.

Subsequently the patients clinically diagnosed as having ACD were subjected to patch test, after obtaining requisite informed consent. The test antigens/allergens belonged to the Indian standard battery and footwear series approved by Contact and Occupational Dermatoses Forum of India (CODFI).

Procedure of patch test We followed the guidelines laid down by the International Contact Dermatitis Research Group (ICDRG) to perform the patch tests. The standard antigens were used to fill up to 3/4th of the aluminum patch test chambers/Finn chambers. Ten such chambers were placed (antigen facing the skin) in two columns over the paravertebral areas, maintaining a distance of 2 cm between consecutive chambers using hypoallergenic adhesive tapes for occlusion. Excessive hair was shaved off prior to the sticking of tape. The patients were also advised to avoid washing their backs and any strenuous exercise that may cause excessive sweating resulting in damage to the adhesive tapes. Indelible ink was used to mark the edge of chambers and denote them numerically (to identify the allergen in each chamber).

Recording of the result The first reading of the results was taken after 48 h of application of the patch (with a waiting period of 45 min following removal of the tapes to allow the disappearance of skin depression due to occlusion). Then the tapes were reapplied and patients were asked to return after 24 h to take the final reading 72 h after application of the patch. The findings obtained in the readings have been categorized according to the ICDRG guidelines as given below.

- (–) negative/absent reaction
- (?) Doubtful erythema only
- (+) Weak erythema, infiltration, papules
- (++) Strong edema or vesiculation
- (+++) Extreme ulcerative or bullous.

All the data obtained were statistically analyzed using MedCalc® v12.5.0 and preserved for future reference.

Results

Amongst 57,167 new patients attending our dermatology outpatient department during the study period, 58 subjects [M:F 1:1.2] presented with clinical evidence of foot dermatitis, thus accounting for a prevalence rate of about 0.1%. Their ages ranged from 6 to 61 years; the mean being 31.48 ± 16.4 years. Most of the patients (15 [25.9%]) belonged to second decade (11–20 years) while geriatric patients (>60 years) presented with the least number of cases (3 [5.2%]) [Table 1]. The mean duration of the disease was 31.4 ± 37.9 months; ranging from 0.5 to 180 months. The dermatitis was bilateral in 85% of the cases.

ACD was the most common pattern of foot dermatitis (23 [39.7%]), followed by ICD [11 (18.9%)] (differentiated by the mode of onset and course of disease progression), hyperkeratotic eczema and pompholyx. Atopic dermatitis and infective eczema were the least common accounting for 3.4% and 1.7% cases, respectively [Table 2]. ACD was more prevalent in female (60.9%) while ICD occurred more commonly in male (63.6%). Dorsal aspects of the feet were involved in more than half of all cases (55%); while scaling (79.3%) and crusting (37.9%) constituted the commonest presentations. Interestingly, scaling was the commonest presentation in ACD (87%) while crusting was the commonest presentation in ICD (82%). Pruritus was the commonest symptom accounting for 85% of the cases, followed by scaling, dryness, and pain.

In the present study, housewives were most commonly affected by foot dermatitis (31%) followed by students (22.4%) and cement workers (13.8%). Footwear was the most common aggravating factor in our study accounting for 22.4% of cases. Seasonal aggravation was reported by 60% of our patients, mostly during summer while almost half of our affected patients (48.3%) had a personal/family history of atopy, thus, highlighting their role as important predisposing factor.

Ten patients (43.5%) out of 23 ACD patients showed a positive (allergic) patch test reaction to at least one allergen of the Indian standard battery and footwear series approved by CODFI. Among these patients, MBT was the commonest contributory allergen (five cases [50%]), followed by potassium dichromate (four cases [40%]), thiuram mix (two cases [20%]), nickel sulfate, glutaraldehyde, and paraphenylenediamine (one case each [10%]) [Table 3].

More than half of these patients (60%) had footwear-induced ACD; thus, establishing footwear as one of the commonest causes of foot dermatitis. Furthermore, the frequency of offending allergens (MBT > potassium dichromate > thiuram mix) suggest rubber chemicals (MBT and thiuram mix) to be the commonest culprit among our patients. Interestingly, in our study, housewives constituted the maximum proportion of patch-test positive patients (50%), almost 60% of these patients reported a personal/family history of atopy. Dorsum of foot was the commonest site to be affected (40%) while half of these patients presented with scaling and crusting as the commonest manifestation.

Discussion

In our study, the most common age group affected by foot dermatitis was 11–20 years which is slightly younger when compared to other similar studies that recorded maximum occurrence between 21 and 30 years.[2,4,5,6]

Our patients showed a female preponderance (55.2%); this finding is consistent with that of other similar studies.[2,4,5] Furthermore, housewives were most commonly affected (31%), thus, corroborating the findings of Huda *et al.*[5] This may be attributed to the fact that housewives are more prone to come in contact with different allergens owing to their nature of work and more frequent change of footwear compared to men.

Dorsa of the feet were most commonly involved in our study (55%) corresponding to the shape of footwear (V-shaped *chappals*). Pruritus was the commonest symptom while scaling and crusting were the commonest presentations. Similar observations have been made by other authors[4,7] while Suryanarayan *et al.*[7] recorded papules and vesicles as the commonest presentation. Footwear was the commonest aggravating factor in our study while 60% of our patients reported worsening of the condition during summer. Priya *et al.*[4] also implicated footwear as the commonest aggravating agent in their study; however, 48% of their patients reported worsening during winter. Summer exacerbation in our study may be explained by the habit of wearing footwear without socks and the role of high humidity in our area. ACD was the commonest type of foot dermatitis in our study followed by ICD while atopic eczema was the least common.

Ten (43.5%) of ACD patients showed a positive patch test reaction to at least one allergen of the Indian standard series approved by CODFI. This value is low when compared to other similar studies in which 50%–80% of patients showed a positive patch test reaction.[2,4,5] This may be explained by the possible omission of some antigens in the Indian standard series, which are yet to be recognized. Thus, further studies are needed to identify these concealed antigens and include them in the Indian standard series. However, we conducted patch tests only on those patients clinically suffering from ACD (40%) for better utilization of limited resources.

In our study, MBT was the commonest allergen followed by potassium dichromate, thiuram mix, and nickel. Priya *et al.*[4] and Epan *et al.*[8] also found MBT to be the commonest allergen in their studies. Several authors have demonstrated potassium dichromate to be the commonest allergen inciting foot dermatitis;[9,10,11] in our study also this agent occupied the second position. Ozkaya *et al.*[12] found nitrofurazone to be the commonest allergen followed by potassium dichromate in a study conducted in Turkey. Dimethyl fumarate (DMF) is a relatively new allergen reported to be inciting foot dermatitis.[13] In our study, rubber shoe allergens, that is, MBT and thiuram mix were more common sensitizers than

leather shoe allergens, that is, potassium dichromate probably due to greater usage of rubber *chappals* (footwear) by our study population; contrary to another Indian study which depicted leather and leather-related chemicals to be the commonest offenders.[11]

Conclusion

Foot dermatitis is one of the common, persistent, and recurrent dermatological disorders, often responding poorly to conventional therapy. Patch testing may play a major role in identifying the causative allergen(s). Adequate counseling of the patients to avoid the offending allergen(s) and providing alternatives may prevent the occurrence of this chronic dermatosis. Thus, a patch test is recommended in all patients presenting with foot dermatitis to identify and avoid the offending allergen(s) to obtain relief. This study also provides adequate insight regarding the types, presentations, and different aggravating factors of foot dermatitis for better management of this condition.

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Conflicts of interest There are no conflicts of interest.

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Figures and Tables

Figure 1

Foot dermatitis due to footwear

Table 1Age and sex distribution of the study subjects ($n=58$)

Age in years	Sex		
	Male	Female	Total
<10	2	3	5
11-20	5	10	15
21-30	4	5	9
31-40	5	6	11
41-50	7	2	9
51-60	2	4	6
61-70	1	2	3
Total	26 (44.8%)	32 (55.2%)	58 (100%)

Table 2Pattern of foot dermatitis ($n=58$)

Pattern of foot dermatitis	Sex		
	Male	Female	Total
Allergic contact dermatitis	9	14	23
Irritant contact dermatitis	7	4	11
Discoïd eczema	1	1	2
Juvenile plantar dermatosis	3	1	4
Infective eczema	1	0	1
Hyperkeratotic eczema	1	5	6
Pompholyx	2	4	6
Stasis dermatitis	1	2	3
Atopic dermatitis	1	1	2
Total	26	32	58

Table 3Result of patch test in patients who tested positive ($n=10$)

Name of the antigen	Number of patients	+	++	+++
Mercaptobenzothiazole (MBT)	5	1	2	2
Potassium dichromate	4	1	1	2
Thiuram mix	2		1	1
Nickel sulfate	1			1
Glutaraldehyde	1		1	
Paraphenylenediamine (PPDA)	1			1

Note: Ten patients showed a positive patch test reaction to at least one antigen; four patients showed a positive reaction to two antigens simultaneously

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