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A Study of Clinico-Pathological and Allergological Correlation in Chronic Palmar Eczema

1Dr. A. Akhila, 2Dr. Ramachander Darak, 3Dr. Karthikeyan. K*, 4Dr. Vijayasankar. P

[1]3rd Year Postgraduate, Department of Dermatology,

Sri Manakula Vinayagar Medical College Hospital and Research Centre,

PUDUCHERRY, India

[2]Professor, Department of Dermatology,

Sri Manakula Vinayagar Medical College Hospital and Research Centre,

PUDUCHERRY, India

[3]Professor and Head, Department of Dermatology,

Sri Manakula Vinayagar Medical College Hospital and Research Centre,

PUDUCHERRY, India

[4]Assistant Professor, Department of Dermatology,

Sri Manakula Vinayagar Medical College Hospital and Research Centre,

PUDUCHERRY, India

ABSTRACT:

Introduction: Hand eczema is a diagnostic term used to describe dermatitis primarily affecting the hands. It can stem from both internal (endogenous) or external (allergic or irritant) factors. The majority of cases involve a combination, where external triggers exacerbate the condition in individuals predisposed to such reactions due to internal factors. It is crucial to identify and avoid contact with triggers for effective management. Patch testing is used to pinpoint the allergens responsible for allergic contact dermatitis.

Methodology: A cross sectional study was done in 110 patients of chronic hand eczema attending out-patient Department of Dermatology in Sri Manakula Vinayagar Medical College and Hospital over a period of one and half year. Socio- demographic and clinical data were recorded from all the patients after getting informed consent. For all suspected cases biopsies were taken to confirm the diagnosis and were subjected to patch test with standardized patch test series (CODFI series).

Results: Mean age among the participants was 40.2 ± 13.6 years, with males having a mean age (SD) of 38.8 ± 13.7 years and females having a mean age (SD) of 41.4 ± 13.6 years. Among them 53% were women and 47% were males. Housewives (31%) were the most commonly affected. Hyperkeratotic type was the most common morphological pattern seen in 42.7% of patients followed by wear and tear type in 22%. Patch test positivity was seen in 72.7% of patients. Paraphenylenediamine (PPD) was found to be the most common allergen seen in 29%. This was followed by parthenium (21%), Potassium dichromate (17%), and fragrance mix (4.5%).

Conclusion: Understanding the diverse causes and clinical manifestations of hand eczema, along with targeted allergen identification through patch testing, is essential for effective management and prevention strategies in affected populations.

Keywords- Clinico-Pathological, Allergological Correlation

Introduction

Hand eczema is the most prevalent occupational skin disease accounting to 40% of cases based on the level of industrialization.[1,2] Eczema is characterized as an inflammatory disorder featuring erythema, edema, infiltration, vesiculation, crusting, scales and lichenification. These lesions may occur sequentially or coalesce, resulting in a polymorphous clinical presentation.[3]

Hands are affected in 80% of occupational skin disease.[4] Hand eczema refers to a collection of eczematous conditions primarily impacting the hands and presents with similar clinical profiles. Classifying hand eczema remains controversial, few classify it based on morphology and etiology of the lesions. It affects approximately 1% of adults[5], with a male to female ratio of 2:1.[6] Lifetime prevalence ranges between 5-7% for women and 5.2-9.5% for men.[7] Hand eczema frequently presents as a distressing condition, causing significant emotional and physical morbidity. Its prevalence in the general population has been estimated at 9.7% over the course of a year.[5]

Hand eczema accounts as the second most common occupational disease in European countries.[8] Incidence of newly diagnosed cases was 0.5 to 1 per 1000 workers.[9] The commonly used diagnostic modality, patch testing was used to identify the specific allergen. Given the challenge in clinically distinguishing between chronic allergic and irritant forms of hand eczema, patch testing plays a critical role in pinpointing the allergens responsible for the dermatitis.

In India, there is paucity of studies showing the magnitude of these problems. Even though numerous studies were done, proper epidemiological data was not obtained; due to factors such as unrecognized workplaces, improper notifications for dermatoses, difficulty in diagnosis, and unreported cases due to few unrecognized organisations. With this background, the objectives ascertained was to describe the various clinical types of chronic hand eczema, to assess the pathological features in chronic hand eczema patients and to correlate the patch test results in patients with features of palmar dermatosis.

Materials and methods

Study setting:

Patients with chronic hand eczema attending Dermatology Out Patient Department in Sri Manakula Vinayagar Medical College and Hospital, a tertiary center in Puducherry were included in this study.

Study design:

A Hospital based cross-sectional study was conducted in a tertiary healthcare setup of Sri Manakula Vinayagar Medical College at Kalitheerthalkuppam in rural Puducherry.

Study participants:

Patients attending Dermatology outpatient department, above 18 years of age, with features of chronic hand dermatoses were included. Written informed consent was obtained from the study population.

Inclusion criteria and Exclusion criteria:

Inclusion criteria includes all patients above 18 years with features of chronic palmar dermatoses diagnosed by two independent dermatologists.

Exclusion criteria includes any contraindications to biopsy like bleeding disorder, patients on systemic steroids more than 20 mg prednisolone/day, patient with disseminated eczema and acute eczema.

Sample size:

Considering the prevalence of positive patch test among hand eczema patients of 65% in a study by Handa S et al, the sample size for present study was calculated to be 108, rounded off to 110 at 95% confidence interval and 9% absolute precision using Open Epi version 3, open- source calculator.[10]

Study duration:

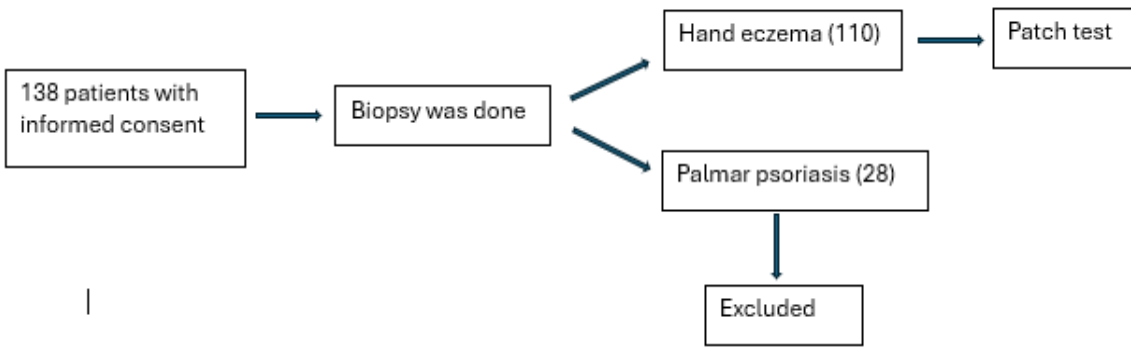
The Study duration was for a period of 18 months from Jan 2023 to June 2024 after obtaining Institutional Ethical Committee Clearance (EC/60/2022).

Data collection procedure:

After obtaining the consent from patient for the study, they were interviewed using a well-structured questionnaire on socio-demographic details, chief complaints, and duration of symptoms, sites involved, details regarding any preexisting illness,

past history of similar complaints, duration of symptoms, treatment history and family history.

General examination and examination of skin lesions was done on the study participants. All the dermatological lesions was photographed after taking consent. After getting informed consent from the patient, biopsy was taken from appropriate site and sent for histopathological examination. Patch testing was done for patients with biopsy confirmed chronic hand dermatitis using standardized patch test series (CODFI series).



Analysis plan:

Data was entered in Epi Info software version 7.2.2.6 and using IBM SPSS Statistics

version 20. To assess the significance of association between independent variables, chi square test or multivariate analysis was used.

Implications of the study:

The implication of this study is to identify the disease morphological and pathological features of chronic palmar eczema patients. Positive patch test in such patients helps to analyse the allergen responsible for the features. This study helps in identifying the cause of the disease and results in better outcome of the patient from their chronicity. These patients are advised to avoid using substances containing the sensitizing allergen.

Reporting of study guidelines:

The study was conducted according to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE).

Results:

Female patients outnumbered male patients with gender distribution of male 47% and female 53% with the largest group aged 21-40 years (50%), followed by 41-60 years age group (33.6%), above 60 years (10%) and the smallest those aged 15-20 years (6.3%). Mean age among the participants was 40.2 ± 13.6 years, with males having a mean age (SD) of 38.8 ± 13.7 years and females having a mean age (SD) of 41.4 ± 13.6 years . The majority of participants reside in rural areas, making up (81) 74% of the patients. Urban residents account for (29) 26% of the patients.

Largest occupational group in the study was housewives (34), followed by 20 farmers, 10 masons, 7 students and 7 daily wage labourers. Other less common occupations encountered among chronic hand eczema patients were teacher, software engineer, security, painters, nurses, florists, electrician, driver, army officer and unemployed individuals.

A significant proportion of the participants 64 (58.1%) have a history of atopy. For individuals exhibiting atopy, 46 out of 64 tested positive for the patch test. Among all, 88 patients exhibited lesions on both hands, followed by right-hand involvement 16 patients, while the left hand was the least affected, with only 6 patients exhibiting lesions.

Hyperkeratotic is the most common condition observed in 47(42.7%) patients, followed by wear and tear dermatitis was observed in 24(22%) patients, Nummular was observed in 10(9%) respectively. Other conditions Finger Tip, Ring eczema, Pompholyx, Focal palmar peeling was observed in 7(6.3%).The lowest condition was observed in Apron eczema only 2(1.8%) patients. Majority of pathogenic characteristics were hyperkeratosis and spongiosis, which affect 98 and 97 patients, respectively followed by inflammatory infiltrates in about 77 patients.

Among 110 patients, patch test was positive in 80 patients (72.7%), with the most common allergen was Paraphenylenediamine (29%) followed by Parthenium (21%) and Potassium dichromate (17%). The least exposure allergen sensitivity observed in Fragrance Mix and Epoxy about 4.5%.

Table 1 - Morphological types among the chronic hand eczema (N=110)

S.no	Clinical diagnosis	N	Percentage (%)
1.	Hyperkeratotic	47	42.7%
2.	Finger Tip	6	5.4%
3.	Ring Eczema	7	6.3%
4.	Pompholyx	7	6.3%
5.	Focal palmar peeling	7	6.3%
6.	Apron eczema	2	1.8%
7.	Nummular	10	9.1%
8.	Wear & Tear	24	21.8%

Table 2: Allergen sensitivity among the chronic hand eczema patients

S.no	Allergen	N	Percentage (%)
1	Vaseline	0	-
2	Wool alcohol	1	1.2%
3	Peru balsam	1	1.2%
4	Formaldehyde	0	-
5	Mercaptobenzothiazole	1	1.2%
6	Nickel sulphate	1	1.2%
7	Colophony	3	3.7%
8	Paraben mix	2	2.5%
9	Neomycin sulphate	4	5%
10	Benzocaine	4	5%
11	Chlorocresol	4	5%
12	Thiuram mix	0	-
13	Nitrofurantoin	0	-
14	Black rubber mix	3	3.7%
15	Cobalt	1	1.2%
16	Potassium dichromate	19	23.7%
17	Paraphenylenediamine	32	40%
18	Parthenium	23	28.7%
19	Fragrance mix	5	6%

20	Epoxy resin	5	6%

Table 3: Relation between morphological type and allergen

S.no	Morphological type	Allergen	Patch test	
			Positive	Negative
1	Hyperkeratotic eczema	Paraphenylenediamine	23(49)	24(51.1)
		Parthenium	11(23.4)	36(76.6)
		Potassium dichromate	10(21.3)	37(78.7)
2	Wear & Tear	Potassium dichromate	5(20.8)	19(79.2)
		Parthenium	7(29.2)	17(70.8)
3	Finger Tip	Fragrance Mix	3(50)	3(50)
		Paraphenylenediamine	1(16)	5(83)

Discussion

Chronic hand eczema with unrecognized cause leads to significant physical, mental and occupational impairment among the patients. As there are varied presentations, determining the diagnosis requires a thorough history, clinical examination, and patch testing to pinpoint the allergen responsible. Similar to Bajaj AK et al[11] and Suman et al [12], higher occurrence was seen among the age group 21-40 years, explains about the active lifestyles of these individuals, who are more prone and has frequent contact with environmental allergens. Females comprised the predominant gender distribution, followed by males. Several studies such as Bajaj AK et al[11] and Quaade et al [13] have indicated a higher prevalence among females, attributed to their frequent exposure to wet work, detergents and also possible due to hormones.[14] In 110 patients, 81 patients had rural background, this can be due to location of our institution.

Certain high risk occupations like cleaners, construction workers and agricultural workers were associated with a higher incidence of hand eczema. Housewives constitute a significant proportion in this study similar to other studies such as Bajaj AK et al[11] and Vigneshkarthik N et al.[15] The repeated trauma from constant exposure of hands to physical and chemical agents like water, vegetables, dust, soaps, and detergents during work may contribute to this. Moreover, allergens are more likely to induce sensitivity when applied to previously damaged skin. In our study, housewives, farmers, and masons comprised the majority of hand eczema patients, this can be due to their inability to change their profession easily in India.

Evidence of atopy was detected in 46 patients, among 64 positive patch test patients. Individuals with atopic dermatitis are more susceptible for developing hand eczema. Hands are the most frequently affected site in adults with atopy similar to Zeerak et al[16]. Statistically significant association ($p = 0.001$) with atopic history was observed.

Majority of our patients had both the hand involvement, followed by fingers; this can be attributed that housewives use the fingers more commonly to peel and slice the vegetables. A study by Suman et al[12] showed fingers involvement in housewives. In this study most of the patients (88) displayed lesions on both hands, followed by 16 patients on their right hand, whereas only 6 patients showed lesions only on their left hand, indicating the left hand was the least affected pertaining to its less use compared to right hand.

Patch test was found to be positive in 80 patients. Zeerak S et al[16] showed positive patch test results in 15 cases (32.6%). The study's findings on positive patch test reactions (52.78%) were consistent with

reported rates ranging from 46.7% to 82% in various studies.[17]

Hyperkeratotic hand eczema was the most common morphological type, similar to Vigneshkarthik et al[15] and varies from other Indian studies, followed by 24 patients (22%) with wear and tear type. About 10 patients (9%) had Nummular eczema, and followed by other conditions like fingertip, ring eczema, and pompholyx, focal palmar peeling with each type containing 7 patients (6.3%).The lowest condition observed was Apron eczema only 2(1.8%) patients.

The most common allergen showing positivity are Paraphenylenediamine (PPD) (29%) followed by parthenium (21%), Potassium dichromate (17%), fragrance mix (4.5%), nickel sulphate (4.5%). Paraphenylenediamine allergy was present in 32 patients, and 21 of them were using hair dye which may be the reason for sensitizing the patients. Paraphenylenediamine can produce a variety of dermatitis. In our study hand eczema produced by PPD is unique and brings out an important fact in any person using hair dye. Hand eczema can be one of the manifestations, where paraphenylenediamine as an unsuspected allergen.

Table – 4 showing various similar studies showing the patch test positivity and the common allergens.

Studies	**Patch test positivity**	**PPD**	**Parthenium**	**Potassium dichromate**	**Fragrance mix**
Handa et al[10]	65%	13%	5%	25%	16%
Doraj et al[18]	48.5%	6%	8%	11%	8%
Zeerak et al[16]	32.6%	38.8%	NA	5.5%	16.6%
Laxmisha et al[17]	52.78%	NA	NA	27.77%	2.77%
Boonstra et al[19]	40%	3.4%	1.5%	5%	6.2%
Suman et al[12]	67%	2%	Not available	18%	3%
Bajaj et al[20]	59%	5.3%	14.5%	11.1%	5.5%
Vigneshkarthik et al[15]	37%	7.4%	3.7%	5.55%	5.55%
Hassan et al[21]	30.4%	9.5%	4.13%	11.57%	6.19%
Present study	73%	29%	21%	17%	4.5%

Parthenium is a well-known and one of the most common allergens seen among the occupationally exposed patients. This weed has the potential of sensitization in about 56% of occupationally exposed individuals without causing any type of dermatitis[22] A study by Bajaj et al[20] also showed parthenium as one of the common allergens.

Parthenium is another allergen which can manifest with a varied spectrum. In any agricultural labourer with hand eczema, patch test with parthenium may be useful in finding the causative factor.

Potassium dichromate was also known as a common sensitizer resulting in the hand eczema more in the developing countries, where addition of ferrous sulphate to cement was not done. Out of 19 chromate sensitive patients, 10 were masons and this sensitivity is commonly associated with the manual labour and masonry as seen with various studies such as Handa et al[10], Laxmisha et al.[17]

Construction industry is the second largest unorganized sector in India. Many people are directly or indirectly involved with this occupation. Both women and men are involved as helpers and come in contact with the cement. These population presenting as hand eczema, cement allergy should be suspected.

Fragrance mix is another common allergen seen in the recent years may be attributed to the repeated

uses of soaps, hand washes and sanitizers due to covid pandemic. Nickel sulphate is a well-known allergen seen commonly among females who wear artificial jewellery, and sensitized during ear piercing, and utensils.

Evidence of atopy was seen in 58% of our patients, of which 71% had positive patch tests. It is known that atopy increases the susceptibility to allergens due to their underlying skin barrier and immune dysfunction.[23] Our results were similar to other studies like Lan CC et al [24], Kokandi AA et al.[25]

Patch test positivity was seen more among hyperkeratotic type of hand eczema similar to Handa et al.[10] Among 42 patch test positive patients most common allergens observed were potassium dichromate, PPD, parthenium and chlorocresol. Wear and tear type showed fragrance mix, parthenium and PPD. Nummular type has potassium dichromate, parthenium and nickel. Fingertip has fragrance mix and PPD.

Potassium dichromate is more commonly associated with hyperkeratotic type followed by nummular type; PPD is associated with hyperkeratotic followed by wear and tear; whereas parthenium is associated with hyperkeratotic type followed by wear and tear followed by nummular type. Fingertip type is associated with fragrance mix followed by potassium dichromate.

The various allergens correlate well with type of hand eczema. Hand eczema is difficult disorder to treat. Diagnosis of the allergens and avoiding it helps in management of this common disorder.

In our study patch test was very useful in unravelling the cause in many cases of hand eczema. The allergens were not surprising but the result was interesting. The most interesting is the top allergen i.e. Paraphenylenediamine (PPD).

Limitations

Limitations of our study include a small sample size. The study population predominantly consists of individuals from suburban and rural areas. The study does not encompass a diverse range of demographics.

Conclusion

About two-thirds of all contact dermatitis cases are comprised of Hand eczema. Understanding the diverse causes and clinical manifestations of hand eczema, along with targeted allergen identification through patch testing, is essential for effective management and prevention strategies in affected populations.

REFERENCES

1. Diepgen TL, Coenraads PJ. The epidemiology of occupational contact dermatitis. Int Arch Occup Environ Health. 1999 Nov;72(8):496-506.
2. Lodi A, Mancini LL, Ambonati M, Coassini A, Ravanelli G, Crosti C. Epidemiology of occupational contact dermatitis in a North Italian population. Eur J Dermatol. 2000 Mar;10(2):128-32.
3. Suzuki NM, Hafner MFS, Lazzarini R, Duarte IAG, Veasey JV. Patch tests and hand eczema: retrospective study in 173 patients and literature review. An Bras Dermatol. 2023 May-Jun;98(3):339-346.
4. Turner S, Carder M, van Tongeren M, McNamee R, Lines S, Hussey L, Bolton A, Beck MH, Wilkinson M, Agius R. The incidence of occupational skin disease as reported to The Health and Occupation Reporting (THOR) network between 2002 and 2005. Br J Dermatol. 2007 Oct;157(4):713-22.
5. Meding B, Jarvholm B. Hand eczema in Swedish adults - changes in prevalence between 1983 and 1996. J Invest Dermatol. 2002 Apr;118(4):719-23.
6. Agrup G. Hand eczema and other hand dermatoses in South Sweden. Acta Derm Venereol. 1969;49:73-84.
7. Montnemery P, Nihlen U, Lofdahl CG, Nyberg P, Svensson A. Prevalence of hand eczema in an adult Swedish population and the relationship to risk occupation and smoking. Acta Derm Venereol. 2005;85(5):429-32.
8. Kurpiewska J, Liwkowicz J, Benczek K, Padlewska K. A survey of work-related skin diseases in different occupations in Poland. Int J Occup Saf Ergon. 2011;17(2):207-14.

9. Diepgen TL. Occupational skin-disease data in Europe. Int Arch Occup Environ Health. 2003 Jun;76(5):331-8.
10. Handa S, Kaur I, Gupta T, Jindal R. Hand eczema: correlation of morphologic patterns, atopy, contact sensitization and disease severity. Indian J Dermatol Venereol Leprol. 2012 Mar-Apr;78(2):153-8.
11. Bajaj AK, Saraswat A, Mukhija G, Rastogi S, Yadav S. Patch testing experience with 1000 patients. Indian J Dermatol Venereol Leprol. 2007 Sep-Oct;73(5):313-8.
12. Suman M, Reddy BS. Pattern of contact sensitivity in Indian patients with hand eczema. J Dermatol. 2003 Sep;30(9):649-54
13. Quaade AS, Simonsen AB, Halling AS, Thyssen JP, Johansen JD. Prevalence, incidence, and severity of hand eczema in the general population - A systematic review and meta-analysis. Contact Dermatitis. 2021 Jun;84(6):361-374.
14. Thyssen JP, Linneberg A, Menné T, Johansen JD. The epidemiology of contact allergy in the general population--prevalence and main findings. Contact Dermatitis. 2007 Nov;57(5):287-99.
15. Vigneshkarthik N, Ganguly S, Kuruvila S. Patch Test as a Diagnostic Tool in Hand Eczema. J Clin Diagn Res. 2016 Nov;10(11):WC04-WC07.
16. Zeerak S, Shah IH, Akhtar S, et al. Clinical Pattern and Patch Test Profile of Hand Eczema in Hospital Employees in a Tertiary Care Hospital of North India. Indian Dermatol Online J. 2021 Jan 16;12(1):72-77.
17. Laxmisha C, Kumar S, Nath AK, Thappa DM. Patch testing in hand eczema at a tertiary care center. Indian J Dermatol Venereol Leprol. 2008 Sep-Oct;74(5):498-9.
18. Dorjay K, Bhushan P, Aggarwal A, Srivastava G, Arif T, Adil M. Study of morphological patterns and identification of contact sensitizers of hand eczema by patch test. Journal of Pakistan Association of Dermatologists. 2019 Oct 6;29(2):151-8.
19. Boonstra MB, Christoffers WA, Coenraads PJ, Schuttelaar ML. Patch test results of hand eczema patients: relation to clinical types. J Eur Acad Dermatol Venereol. 2015 May;29(5):940-7.
20. Bajaj AK, Saraswat A, Mukhija G, Rastogi S, Yadav S. Patch testing experience with 1000 patients. Indian J Dermatol Venereol Leprol. 2007 Sep-Oct;73(5):313-8.
21. Hassan I, Akhtar S, Zeerak S, Rasool F, Rather PA, Bhat YJ, Latif I, Rather S, Mubashir S, Jeelani S, Devi R, Bashir Y, Nabi N, Batool S, Aleem S. Clinicoepidemiological and Patch Test Profile of Patients Attending the Contact Dermatitis Clinic of a Tertiary Care Hospital in North India: A 7-Year Retrospective Study. Indian Dermatol Online J. 2019 Nov 1;10(6):669-675.
22. Mahajan VK, Sharma V, Gupta M, Chauhan PS, Mehta KS, Garg S. Parthenium dermatitis: is parthenolide an effective choice for patch testing? Contact Dermatitis. 2014 Jun;70(6):340-3
23. Kezic S. Atopic dermatitis: risk estimates for hand eczema. Br J Dermatol. 2018 Apr;178(4):827.
24. Lan CC, Tu HP, Lee CH, Wu CS, Ko YC, Yu HS, Lu YW, Li WC, Chen GS. Hand dermatitis among university hospital nursing staff with or without atopic eczema: assessment of risk factors. Contact Dermatitis. 2011 Feb;64(2):73-9.
25. Kokandi AA. Hand dermatitis among nurses at a University Hospital in Saudi Arabia. Biomedical Research 2017;28:6687-92.