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Original Article

Clinical Pattern and Patch Test Profile of Hand Eczema in Hospital Employees in a Tertiary Care Hospital of North India

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Abstract

Introduction: Health care workers form an important occupational group with a high risk of hand eczema. All health care professionals are exposed to a variety of allergens and irritants which can cause hand dermatitis, resulting in significant morbidity. **Aims and Objectives:** To assess the clinical profile of hand eczema in hospital employees, to perform patch test in relevant cases and to find out the most common sensitizers in them. **Materials and Methods:** This was a cross-sectional, hospital-based study in which the staff was screened for features of hand eczema and patch testing was done in the suspected cases of allergic contact dermatitis. **Results:** Out of 340 employees screened, 46 employees (13.5%) suffered from hand eczema. The most common type was wear and tear dermatitis accounting for 17 (36.9%) cases, followed by discoid eczema, pompholyx, focal palmar peeling, finger-tip eczema, hyperkeratotic eczema, ring eczema, and unspecified types. Patch testing was positive in 15 (32.6%) cases. The most common allergen was paraphenylene diamine, followed by fragrance mix, nitrofurazone, mercaptobenzothiazole, potassium bichromate, black rubber mix, and thiuram mix. A statistically significant association (0.001) was found with an underlying history of atopy. **Conclusion:** Hand eczema is a commonly encountered dermatological complaint in many hospital employees. Proper counseling, work, up, patch testing, and treatment can mitigate the symptoms in such employees.

Keywords: *Hand eczema, health care workers, occupational, patch testing*

Introduction

Occupational contact dermatitis is nowadays one of the most common occupational skin diseases in both developed and developing countries, and is associated with significant impact on the quality of life.[1] It encompasses several variants, with hand eczema being one of the most common type, accounting for 70–90% cases of occupational contact dermatitis.[2,3] A large number of occupational groups have susceptibility for hand eczema due to contact with various irritants and allergens, depending on the nature of the profession. Health care workers and professionals form one such group which is at a higher risk of occupational hand eczema/dermatitis. This can be attributed to prolonged wet work (that frequently involves hand decontamination procedures crucial in hospital work to avoid nosocomial infections) which has been proven to be increase the risk of hand dermatitis two-fold as compared with dry office work.[4,5] Moreover, persistent contact with numerous incriminators like gloves, alcohol-based hand rubs/sanitizers, antiseptics, disinfectants, detergents and numerous laboratory chemicals and related equipment also makes them vulnerable to this occupational dermatitis.[6]

In addition to these environmental factors, numerous studies have also demonstrated that some intrinsic factors (like atopic dermatitis) increase the predisposition of this group to hand eczema. Atopy has been found to increase this susceptibility due to underlying skin barrier and immune system dysfunction.[7]

Limited literature pertinent to this topic is found in our sub-continent. With this background, we attempted to study the prevalence, pattern, and patch test profile of hand eczema in the employees of our hospital.

Materials and Methods

This was a cross sectional study which was carried out in the Contact Dermatitis Clinic of the Department of Dermatology,

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Venereology, and Leprology, on various staff members/ employees of SMHS hospital and the employees of various departments of the associated Medical College. The screening was conducted by visiting the departments and related sections of the college and hospital after obtaining clearance from the Institutional Ethical committee and after a proper consent from each subject. A total of 340 employees were screened over a 3-month period from September to November, 2019.For the ease of our study, the employees were categorized as per their designation into doctors, nursing staff, researchers, laboratory technicians, theatre technicians, nursing orderlies, and dressers.

A questionnaire was formulated to collect relevant data with questions pertaining to demographic variables (age, sex, and residence), designation, duration since employed, hours of daily work, whether engaged in wet work and contact with gloves, disinfectants, sanitizers, and instruments. Additional questions included history of atopy/atopic dermatitis and whether any cutaneous change involving the hands was present. A cutaneous examination was then done to ascertain the clinical presence/absence of hand eczema and if present, its clinical variant. A morphological classification was used to categorize the various patterns observed into Apron eczema, Discoid eczema, Fingertip eczema, Focal palmar peeling, Pompholyx, Hyperkeratotic palmar eczema, Wear and tear dermatitis, and unspecified patterns (e.g., gut eczema chronic acral dermatitis).[8]

Finally, the positive subjects (those with hand eczema) were subjected to patch testing by the Finn chamber method using the Indian Baseline Series (ISS) of 20 allergens. This was done only after an informed consent and after explaining the procedure and the significance of the procedure to them. All forms of medication (topical as well as oral) were stopped 2 weeks prior to subjecting the patients to patch testing. The patch tests were applied on the upper back of the cases and the results were recorded after48 hours (D2) and 96 hours (D4). The positive results were graded according to the International Contact Dermatitis Research Group criteria.[9] In doubtful cases, a day 7 reading was also taken.[10]

We determined the relevance of positive patch test results clinically using COADEX system.[11] In this system, current and old relevance means that patient has been exposed to the allergen during the current and previous episodes of dermatitis, respectively, and there is improvement of the disease after cessation of exposure. Relevance is termed to be doubtful when relevance is difficult to assess and no traceable relationship is found between the positive test and the disease.

Statistical analysis

The data at the end of the study was entered in Microsoft Excel and analyzed by Epi-Info version 7.2.3.1. In order to test the significance of continuous variables, T-test was used while Chi-square was used for categorical variables. Where the latter was not applicable, Fisher's exact test was used.

Results

A total of 340 employees were screened over a 3-month period. Of these, 190 (55.9%) were males and 150 (44.1%) were females, giving a male:female ratio of 1.2:1.The age of the employees ranged from 21 years to 60 years with a mean age of 25.4 years. Of the employees screened, 196 (57.65%) were from an urban background while 144 (42.35%) were from rural areas. The employees screened were stratified as per their designation into various groups which are shown in Table 1.

Out of these 340 people, 210 (61.76%) were exposed to various disinfectants, sanitizers, and other laboratory chemicals while 130 (38.24%) were not in contact with all these chemicals. Gloves were used by majority of them, accounting for 267 (78.53%) while a minority of 73 employees (21.47%) did not use them during their routine work. Instruments were used by 180 (52.94%) employees while a comparable number of 160 (47.06%) people did not use them.

A majority of 272 (80%) employees were engaged in wet work while a small number of 68 (20%) persons were not involved in any kind of wet work.We also found that 26 (7.6%) employees were found to be positive for atopy.

Out of 340 subjects, 46 employees suffered from some variant of hand eczema, giving a prevalence of 13.5% in the study group. Within this sub-group with hand eczema, males, and females accounted for 24 (52.2%) and 22 (47.8%) cases with a mean age of 30.7 years. While analyzing these positive cases as per their job profile, doctors accounted for 15 out of 46 cases (32.6%), followed by 11 cases (24%) in nurses, 8 cases (17.4%) in theatre technicians, 4 cases (8.7%) each in nursing orderlies and laboratory technicians and 2 cases (4.3%) each in researchers and dressers. The most common variant of hand eczema encountered was wear and tear dermatitis accounting for17 (36.9%) cases, followed by 7 (15.2%) cases of discoid eczema, 6 (13.04%) cases of pompholyx, 5 (10.9%) cases each of focal palmar peeling and finger-tip

Table 1: Designation-wise stratification of the study population

Designation	No. of employees	Percentage
Doctor	142	41.76%
Nurse	64	18.82%
Theatre technician	38	11.18%
Nursing orderly	32	9.41%
Laboratory Technician	32	9.41%
Researcher	19	5.59%
Dresser	13	3.82%
Total	340	100%

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eczema, 3 (6.5%) cases of hyperkeratotic eczema, 1 (2.1%) case of ring eczema and 2 (4.3%) cases of unspecified type[Table 2 and Figures 1-5]. Within the sub-group, 11 had atopy.

While correlating the various contributory factors (instrument usage, use of disinfectants, engagement in wet work, use of gloves, and atopy) with the prevalence of hand eczema, a statistically significant association was found only with an underlying history of atopy (11 with a positive history of atopy, out of 46). The *P*- value here was 0.001.

Table 2: Morphological types of hand eczema observed in the study group

Type of Eczema	No. of employees	Percentage
Wear and tear	17	36.9%
Discoid	7	15.2%
Pompholyx	6	13.04%
Focal palmar peeling	5	10.9%
Finger tip eczema	5	10.9%
Hyperkeratotic	3	6.5%
Unspecified	2	4.3%
Ring	1	2.1%
Total	46	100%

Figure 1:A laboratory worker with wear and tear variant of hand eczema involving primarily the palmar surface of both hands with positive patch test reaction to nitrofurazone with current relevance

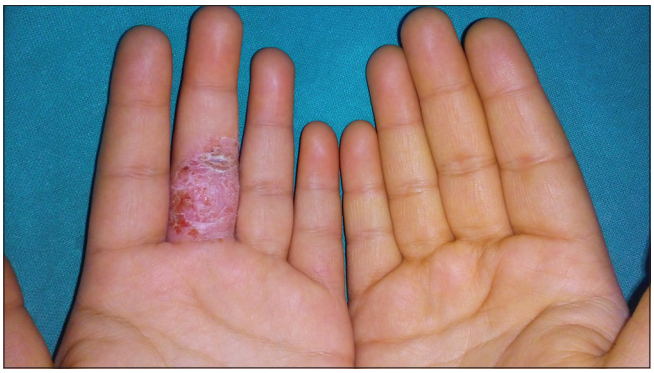

Figure 3:A resident doctor with ring eczema with a negative patch test

Out of these 46 cases of eczema, patch testing was positive in 15 (32.6%) cases and a day – 4 reading was taken to be significant. A total of 18 positive reactions were seen in these 15 cases, among which 12 patients gave positive reaction to a single allergen while 3 gave positive reaction to two allergens simultaneously. The most common allergen was PPD (paraphenylene diamine) seen in 7 cases , followed by fragrance mix and nitrofurazone in 3 cases each, mercaptobenzothiazole in 2 cases, potassium bichromate, black rubber mix, and thiuram mix in 1 case each[Table 3 and Figures 6-8].

Discussion

Hand eczema affects a substantial proportion of the world's population in general and a more significant percentage of various occupational groups in particular.[12] The prevalence and clinical patterns vary in different professional groups, depending on the type of work, degree, and duration of exposure to various triggers and presence or absence of

Figure 2:A dresser with hyperkeratotic eczema with a positive patch test to fragrance mix and black rubber mix with current relevance to both antigens

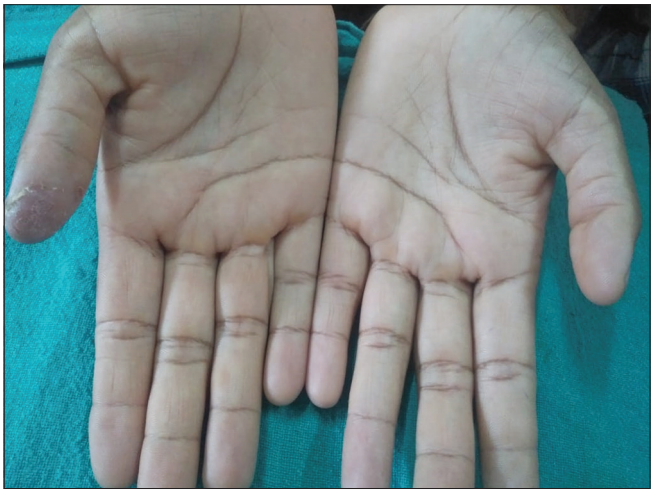

Figure 4:A dresser with finger tip eczema with a positive patch test to PPD with current relevance

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Figure 5: A nurse with focal palmar peeling with a negative patch test

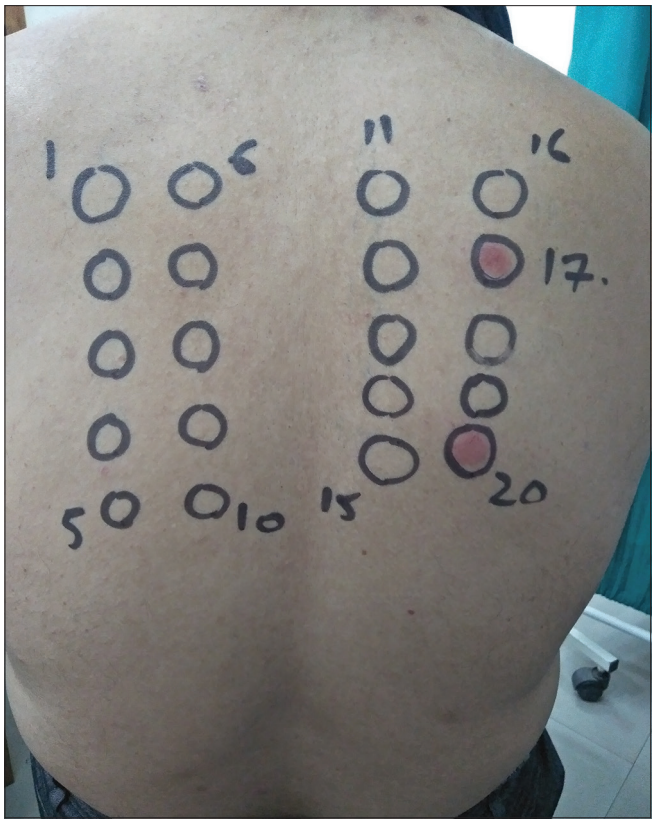

Figure 7: Positive patch test (1+) to fragrance mix and black rubber mix in the dresser with hyperkeratotic eczema on Day 4 with current relevance to both antigens

Figure 6:A laboratory worker with wear and tear variant of hand eczema with positive patch test (1+) to nitrofurazone on Day 4 with current relevance to the antigen

Figure 8: Positive patch test (3+) to PPD in a dresser on Day 4 with current relevance

underlying intrinsic susceptibility. Over the years, it has gained increasing significance as an important occupational dermatoses due to its socioeconomic consequences with a direct impact on the patients' quality of life.[13]

In our study, the prevalence of hand eczema was found to be 13.5%.This prevalence was lower than that observed in other studies conducted in different countries. Prevalence of 21%, 26%, and 35% were obtained in studies conducted on health care professionals in Denmark, United States, and Japan, respectively.[14-16] This difference in prevalence could possibly be due to the larger sample size in these studies. Moreover, difference in the composition of study populations (being composed of both clinical and non-clinical staff in our study unlike the predominance of only clinical staff in reference studies) could account for our lower prevalence. However, the prevalence in our study was much higher than that seen in the routine Indian dermatologic outpatient departments (3.3–6.6%).[17] This clearly indicates an occupational association of hand eczema in our study.

The strong association of hand eczema with an underlying history of atopy (P value <0.05) was an important observation in

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Table 3: Pattern of positive patch test reactions

Name of antigen	No. of positive reactions to individual antigens	Relevance of positive patch test reactions
PPD (paraphenylene diamine)	7	Current - 2 Old - 2 Unknown - 3
Fragrance mix	3	Current - 2 Unknown - 1
Nitrofurazone	3	Current -2 Old -1
Mercaptobenzothiazole	2	Current -1 Old - 1
Potassium bichromate	1	Unknown - 1
Black rubber mix	1	Current - 1
Thiuram mix	1	Current -1
Total positive reactions seen with relevance of individual allergens	18	Current - 9 Old - 4 Unknown - 5

our study. It validated numerous studies wherein atopy was found to the most important underlying factor predisposing to hand dermatitis**.** Our results were similar to studies done on health professionals in Taiwan and Saudi Arabia wherein a strong association between atopic dermatitis and hand eczema was found.[18,19]

On analyzing patch test results, PPD was found to be the most common allergen identified in 7 (38.8%) out of 18 positive reactions. Even though current and old relevance were observed in 2 reactions each, but it was due to hair dye application with little direct relevance to the occupation being studied. In the remaining cases, it could be due to cross-sensitization to PPD-related chemicals (used as anti-oxidants in various rubber products) in the health care professionals.[20]

Fragrance mix was the next common allergen seen in 3 cases. This positivity could be explained due to the repeated use of soaps, hand washes, and sanitizers that often contain one of the various ingredients of fragrance mix.[21]

Another positive antigen identified was nitrofurazone which was seen in 3 cases. This antigen is an important component of many topical antibacterial creams, powders, and dressings. It has been used for the treatment of various infections in hospitals, pyodermic infections, and cutaneous ulcers.[22] So patch test positivity to this antigen is consistent with our study population.

Positivity to mercaptobenzothiazole, black rubber mix, and thiuram mix was seen in 1 subject each. This could be attributed to the presence of these sensitizers (which can cause allergic contact dermatitis) in rubber gloves, slippers, rubber sheets, and numerous instruments (containing one or more than one of these allergens) in operation theatres, hospital wards, and laboratories by various doctors, nurses, and their supportive staff.[23]

Our patch test results are similar to those seen in a study by Gupta SB *et al*.[24] who found that thiuram mix, antibiotics (e.g., nitrofurazone) and cleansers as sensitizers were more common in healthcare workers as compared with controls.

These findings show that health care workers (especially with underlying atopy) are susceptible to hand eczema due to the nature of their job. So proper protective measures, judicious use of barrier creams and regular heath check-ups should be promoted in this occupational group.

However, the small sample size and inability to do "as is" testing for certain laboratory and operation theatre chemicals were the limitations of this study.

Conclusion

Hand eczema is a commonly encountered dermatological complaint in many hospital employees. Our study showed that an intrinsic susceptibility (atopy or atopic dermatitis) can worsen hand eczema in such professionals. The working environment may additionally aggravate this variant of hand dermatoses. So, a proper clinical work-up, patch testing and early treatment can alleviate the symptoms of these professionals. Additionally, proper counselling about workplace preventive strategies (use of hypo-allergenic gloves, proper handling of chemicals, frequent use of emollients, etc.) can help to decrease the incidence of hand eczema and thus reduce associated morbidity in them.

Declaration of patient

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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