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Clinico-epidemiological pattern of hand dermatitis among healthcare workers of tertiary care centre in central India

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Abstract

Background: Hand dermatitis is a common occupational disease among healthcare workers. The global pandemic due to coronavirus disease-2019 (COVID-19) has attributed to a further increased burden as hand washing with soap, water, and alcohol-based disinfectant was increased to prevent contact transmission. It not only causes cosmetic, and psychological distress it also leads to decreased work efficiency and absenteeism from work.

Aims: This study aims to evaluate various clinico-epidemiological patterns, the frequency, risk factors, and clinical features of hand dermatitis among healthcare workers in central India and measure its impact on quality of life and utility of patch testing.

Method: A cross-sectional study was conducted in a tertiary care center in India from January 2020 to August 2021. All healthcare workers (1112) were screened for hand dermatitis, patch testing was done among cases along with detailed history and examination, and the impact on quality of life was assessed.

Result: The period prevalence of healthcare-associated hand dermatitis was 8% (CI:6.5%-9.71%). This included sub-groups of doctors (3.5%), nurses (6.75%), sanitation workers (11.02%), and laboratory technicians (20%). Scaling and erythema were the common morphological findings and the dorsum of hand and web spaces were the commonest site of involvement. Latex gloves were the most common exacerbating factor

(82.6%) followed by sanitizer (55.1%). The odds ratio of the frequency of handwashing and risk of development of hand dermatitis was 4.25(CI:0.58-92.06), and 70% had an increased frequency of handwashing (10 times/day). Nineteen percent have positivity to latex gloves in the patch test. Atopy was present in 27.50% of participants. The majority of cases had mild disease severity and minimal impact on quality of life.

Conclusions: Hand dermatitis is prevalent among healthcare workers, various occupation-associated factors and genetic factors accumulate and predisposes an individual to the development of hand dermatitis. Proper hand care practices reduce the severity and even prevent from the development of hand dermatitis. Patch testing is useful in identifying any allergic element.

Keywords: Hand Dermatitis, occupational dermatoses, hand eczema, Healthcare workers, contact dermatitis

Introduction

Hand dermatitis is one of the most relevant occupational-associated dermatoses among healthcare workers. It can present as an irritant, allergic contact dermatitis, or atopic hand dermatitis. Healthcare workers (HCW) are at risk mostly owing to frequent glove use and exposure to chemicals or detergents used for hand hygiene practices. Hospital cleaning staff particularly are exposed to chemicals during cleansing work or segregating the waste. Doctors and nursing staff commonly develop contact dermatitis from latex gloves, sanitizer, and soaps.[1] Laboratory technicians have exposure to gloves, various solvents, formaldehyde, acrylic monomers, etc. In addition, many healthcare workers had exacerbation of pre-existing dermatoses due to prolonged use of latex gloves, repeated use of sanitizer, and frequent hand washing.

Various job-related (prolonged use of gloves, solvents, soaps, detergents, microinjury and trauma, over-zealous hand hygiene practices), host-related (dry skin, hyperhidrosis, and atopic diathesis), environmental factors (hot and humid climate leads to accumulation of sweat and during cold, dryness of the skin increases) have a significant role in the commencement of dermatitis in HCWs.[1-4]

Hand dermatitis has a variable impact on the quality of life depending on the severity. It has a proven impact on efficiency and can lead to absenteeism from work. A patch test is a gold standard for diagnosing cases of allergic contact dermatitis in vivo. Apart from standard series as per region developed by dermatoses forums, suspected allergens can also be tested as specified by the patient in patch testing.

Till now, very few studies have been conducted in India (especially central India) determining the prevalence of hand dermatitis in healthcare workers and confirming the associated factors using the patch test (latex gloves and sanitizer). This study tried to determine the prevalence and impact of hand dermatitis in healthcare workers of Tertiary care hospital in Central India.

Method

The study was single centred cross- sectional observational study. The study was conducted after IHEC approval for a period of 18 months from January 2020 to August 2021. The primary objective is to find prevalence and clinical patterns of hand dermatitis in health care workers (Nursing staff, Cleaning staff, nursing attender, laboratory technicians, doctors, etc.) of our hospital. Secondary objectives were to measure patch test positivity with Indian standard series and other suspected allergens in patients having hand dermatitis and the impact of hand dermatitis on quality of life using

the Dermatology life quality index and Skindex-16 questionnaire. The estimated sample size by formula for screening was 750 (as per formula in supplementary file).

Result

Total 1112 healthcare workers were screened for hand dermatitis, out of which 49% (548) were nursing staff, 36%(399) doctors, 12%(136) sanitation workers, and 1.3% each laboratory technician (15) and attender (14). Of these, 94 had hand dermatitis out of which 69 were included (5 excluded due to other well-known cause for hand dermatitis and 20 denied participation) [Figure 1 A]. Thus, during the study period, prevalence of hand dermatitis among healthcare workers was 8.45% (CI: 6.94- 10.2%), including cases with other known causes of hand dermatitis. The prevalence of hand dermatitis associated with healthcare occupation was 8.0% (CI: 6.5- 9.71%). The demographic details were described in table1.

Itching was the most common symptom followed by exfoliation. Latex gloves was the most common exacerbating factor followed by alcohol-based sanitizers. Various factors and symptoms are described in table 2. Personal history of atopy was present in 27.50% of participants whereas family history of atopy was present in 29%. 36.20% had more than 1hour/day of wet work. Odds ratio for severity of hand dermatitis was higher in cases with frequency of hand washing more than 10times/day and duration of gloves usage for more than 4 hours/day (table 3).

Other routine practices which could have potentially altered participants lesions are detailed in Figure 1B. Seven participants had known allergy to dust, 6-to artificial jewellery, 4-to detergents, and 2-to leather. Only seven (10%) participants had previously experienced hand dermatitis before this episode, while 90% of them experienced it for the first time during the COVID-19 pandemic.

The site of involvement varied among various occupations; web space and dorsa of hand were involved among nursing staff, and sanitation workers; dorsal and palmar aspect of fingers were involved in laboratory technicians. The most common morphology noted among nursing officers, doctors, and sanitation workers were scaling [Figure 2] followed by vesiculation [Figure 3], whereas laboratory technicians had fissuring and vesiculation. Scaling was most commonly recorded on web spaces [Figure 4], fingertips, and dorsal and palmar aspects of fingers. Whereas the dorsa of the hand showed erythema only [Figure 5]. Lichenification was least observed in all regions [Figure 6].

Patch test

Patch test was performed in 42 cases (27 denied) using the Indian standard series, and additional allergens such as latex gloves inner and outer sides, nitryl gloves inner and outer sides, and alcohol-based sanitizers. Patch test positivity was seen in 27.9%, and eight cases (19%) had a positive reaction to latex gloves. One out of eight cases developed a +2 reaction and had an allergy to both sides of latex gloves [Figure 7], while the rest developed only a reaction to the inner side of latex gloves. Two cases developed a reaction to nickel (+1 reaction in one case and +2 reaction in another) and one showed a reaction to potassium bichromate and fragrance mix +1 reaction each.

Hand dermatitis severity Score

The Median HECSI score was 4 with an interquartile range of 2.0- 8.0. Sixty-two (89.8%) cases were having mild hand dermatitis (HECSI score 0-11), six (8.6%) were having moderate hand dermatitis (HECSI score:

12-27) and only one (1.4%) case had severe hand dermatitis (HECSI score: >27) [Figure 8]. Majority of the cases had insignificant impact on quality of life measured by DLQI score and SKINDEX 16 score. [Figure:9]. Pearson correlation plot suggests a significant correlation between HECSI and DLQI score, HECSI and SKINDEX-16 score, and SKINDEX-16 score and between wet work hours and the duration of gloves used [Figure:10]

No significant association could be established between clinical symptoms, aggravating and relieving factors, occupation associated risk factors, site, morphology, HECSI score, DLQI and Skindex16 score with various cadres of HCWs. Various scores were equally distributed among various cadres of healthcare workers demonstrating no significant predisposition of any particular group for severe hand dermatitis [Figure 11].

Discussion

In this cross-sectional observational study, 1112 HCWs were screened, and 69 HCWs were enrolled of various cadre with hand dermatitis. The prevalence of hand dermatitis has been variably reported from 4.9%- 30.5% across the world,[5–9] intra-occupational prevalence among doctors is 6.9-32.6%,[5,10,11] nursing officers is 6.8%- 32%,[5,7,10–12] sanitation worker is 9.5%-21.6%[7,13,14] and laboratory workers is 8.7%- 23%.[11,15] The overall point prevalence was found to be 8.0% (CL:6.5- 9.71%), doctors (3.5%), nursing officer (6.75%), sanitation workers (11.02%) and laboratory technicians (20%) in our study, concordant with other Asian countries.

Most common symptoms reported were itching, exfoliation, papules, erythema, vesicles and fissuring, fewer cases had dryness, burning, erosions, excoriation, thickening and hyperpigmentation. No severe reaction was reported. Gertler et al had reported dryness, erythema, itching, burning and scaling.[16] Makonnen et al reported redness and burning.[12] Variation in symptoms can be because of variability in exposed allergen, concentration and duration of exposure, underlying predisposing factors and hand care practices.

The development or severity of hand dermatitis did not appear to be significantly correlated with atopy, which is concordant with previous studies.[6,12,17]Latex gloves were reported the most common aggravating factor in 82.6% cases history-wise, but latex glove allergies could be established only in 8.6% which was lower as compared to study from Jordan by Khader et al (13.6%)[18], Germany by Raulf, M (9.5%)[19] and Sri Lanka by Amarasekera M et al (11.4%).[20] We also noted exacerbation of hand dermatitis with increased frequency and duration of use of gloves for more than 4 hours/day with odds ratio of 2.61 (CI:0.49-15.70) which was inconsistent with other studies.[5,12,16,17,21] Aggravation by alcohol-based Sanitizer and cleaning agents was found in 55.1% and 15.9% cases respectively, which is discordant with study by Jain et al(12% and 24%respectively).[6]Upsurge in cases could be due to significant increase in the use of sanitizer among healthcare workers.[22–25]

Median time interval between restarting work and recurrence of symptom reported in this study was 4 hours (IQR: 1-48 hours). Jain et al reported improvement in symptoms after stopping work in 64% of cases and 69% worsened while at work whereas in the present study we reported 89.9% had improvement after stopping work or after taking a vacation and 87% had recurrence after restarting work. [6]

Odd's ratio of frequency of handwashing and risk of development of hand dermatitis was 4.25 (CI: 0.58-

92.06), 70% had a frequency of handwashing more than 10times/day. Callahan et al (Cleveland) and Mekonnen et al reported 1.55 and 1.8 times increased risk among HCW who washed hands for more than 10times/day and more than 11times/day respectively.[12,26] Flyvholm et al reported significant association of hand dermatitis among HCWs washing hands for more than 20times/day.[21] Huang et al (Guangzhou) noticed 4.83 times the odds of developing hand dermatitis with frequency of handwashing more than 50times/day compared to less than 10 times/day.[5] Similar to our study various studies have reported increased development of hand dermatitis after an increase in the frequency of handwashing but with insignificant p values.[11,17,27]

Commonly involved sites were webspaces, followed by fingers (palmar aspect > dorsum > fingertips), dorsum and palmar aspect of hands. Huang D et al have reported most common site as fingers > dorsum of the hand and fingertips.[5] Nineteen percent cases developed a positive reaction to latex gloves (mostly inner side of glove) which was higher when compared to studies by Amarasekera M et al (11.4%)[20], Khader Y et al (13.6%)[18], Raulf, M (9.5%)[19]and are lesser when compared to reports of Turjanmaa et al (12/13 case) [29], Dejonckheere et al (56%)[30] and Jain et al (50%)(North India).[6] There is role of starch powder as a predisposing factor to latex glove sensitivity.[31]

Hand Dermatitis Severity Score reported was 5.78(+/-5.16) which is much lesser, in contrast, to the study by Gupta et al (9.39+/-8.17).[7] This could be because of a greater number of milder cases in our study, single episode of hand dermatitis in a larger population, early behavioral changes, and increased awareness regarding hand care. The mean DLQI score in our study is 4.04 +/-3.08 which is comparable with Gupta et al study (5.37+/-4.76).[7] SKINDEX-16 score showed similarity to DLQI score with a median of 12.0(IQR:7.0-20.0) suggesting a small impact of hand dermatitis on the quality of life of healthcare workers. Similar to our study, others have also shown parallel results between different scoring systems. Limitations of our study includes negative impact due to covid 19 pandemic as many cases denied patch testing as they can't keep their back dry for 4 days (hygiene issue) and delay in screening, reporting, and patch testing; not all known latex gloves associated allergens could be tested because of the nonavailability of allergens (Carba mix, N-phthalimide, hydroquinoline, napthylamine), all cases who had hand dermatitis couldnot be enrolled and patch tested. Results of binary logistic regression were indicating a trend for a higher odds ratio among risk factors. Our study sample size was a key limitation for the significance of the model. R^2 Tjur of the model was 0.105 indicates only 10% variation in model code for the dependent variable.

Conclusion

Hand dermatitis is prevalent dermatoses among healthcare workers. Use of gloves (duration, frequency, and type of gloves), hand sanitizer and strong detergents, wet work duration, and cleaning agents all aggravate or predispose for the development of hand dermatitis. Hand care practices have a significant role in reducing the severity and postponing the onset of hand dermatitis. Over-zealous use of hand hygiene materials without proper hand care practices might have led to the development of hand dermatitis in most of our cases during Covid time.

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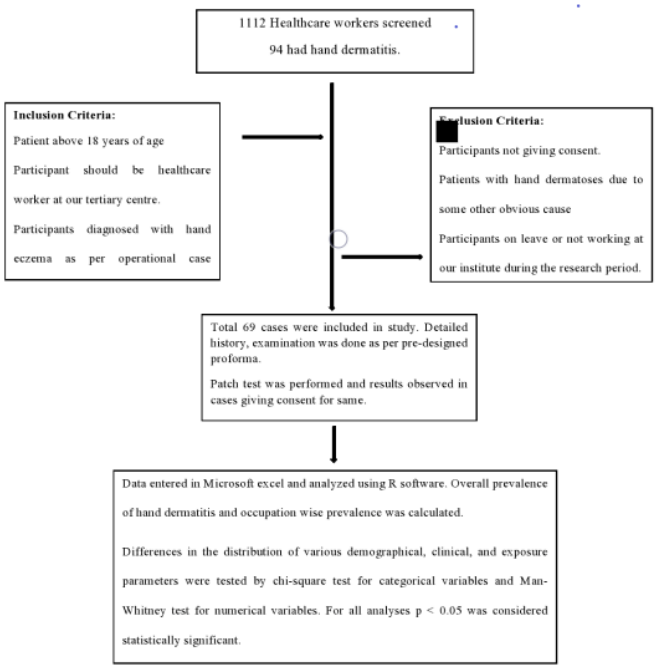
Legend Figure



Flowchart 1: Representing methodology of Study

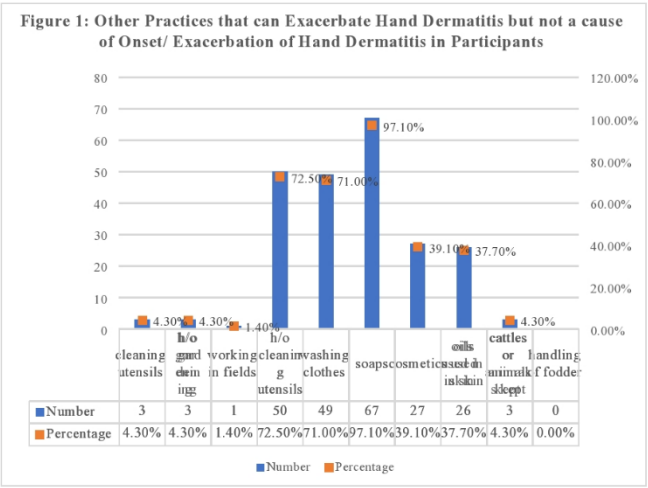


Figure 2: Scaling over Fingers and Thumb

Figure 3: Erythema and Vesiculation over Palmar aspect of Hands and Fingers

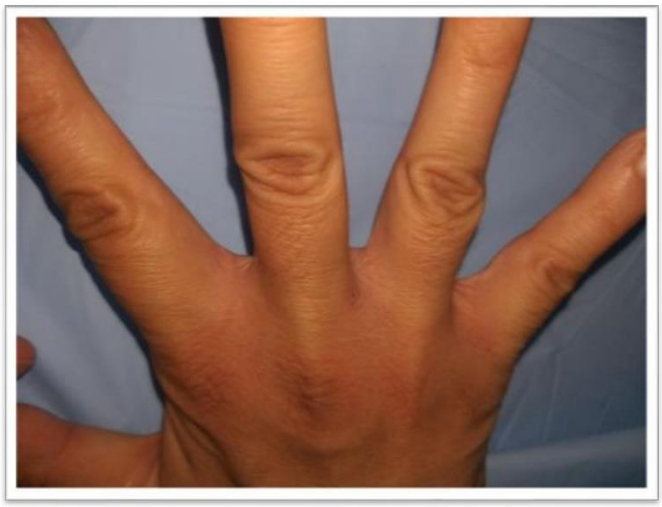


Figure 4: Erythema and Scaling over Web Spaces

Figure 5: Erythema and papules over dorsum of hands

Figure 6: Lichenification over dorsum of hand

Figure 7: Participant developed +2 reaction to both sides of Latex Gloves

Figure 7: Participant developed +2 reaction to both of latex gloves

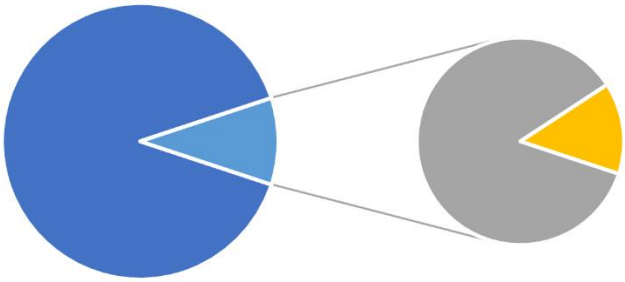


Figure 8

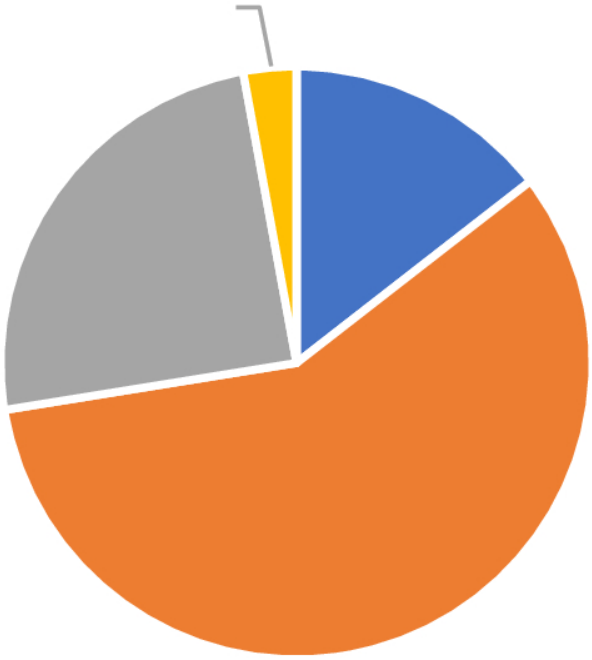


Figure 9

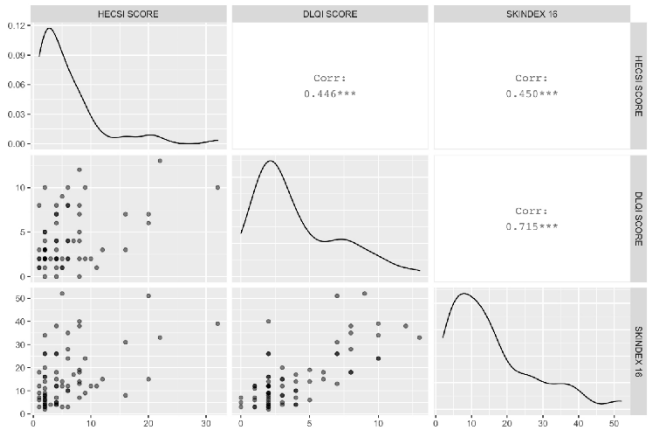
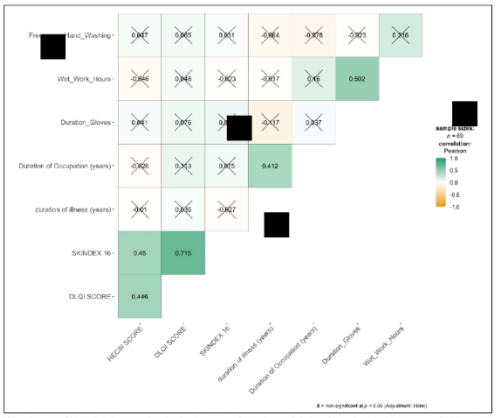


Figure 10: Correlation plot between HECSI Score DLQI and skindex -16 score

Figure-11: Pearson Correlation Plot between Various Scores and Occupation Associated Risk Factor



We have fitted binary logistic regression in which the dependent variable was HECSI score severity category (</= 11 = 0 and >/=12 = 1) was entered and age, frequency of handwashing (>/=10 times/day), sex, duration of gloves use (>/= 4 hours) and wet work hours (>/=2 hours) were entered as predictor variables. Odd's ratio and confidence interval are shown in the table:4. The overall model was statistically not significant.

Table no .1 : Demographic details of Healthcare workers with Hand dermatitis

Characteristic	N = 69[1]
Sex: Male/Female	41(59.4%)/ 28(40.6%)
Age	28.0(27.0, 31.0)years
Monthly income(Rs)	65,000.0(32,000.0, 65,000.0)
Education status	
</=12th	15(21.7%%)
Graduate	48(69.6%)
Post-Graduate	6(8.7%)
Working in this center(years)	2.0(1.0, 3.0)
Duration of illness(years)	0.5(0.2, 1.5)
Married	41(59.4%)
Occupation: BVG Doctor lab technician nursing officer	 15(21.7%) 14(20.3%) 3(4.3%) 37(53.6%)

Table no. 2: Association between Various Factors, symptoms and Occupation of Participant:

Occupation→ History of exacerbation after:	Total no. 69(%)	Sanitation worker n=15	Doctor n=14	Laboratory Technician n=3	Nursing officer n=37	p-value
Exposure to Gloves	57(82.6%)	14(93.3%)	11(78.6%)	1(33.3%)	31(83.8%)	0.117
Alcohol-based sanitizer	38(55.1%)	7(46.7%)	9(64.3%)	2(66.7%)	20(54.1%)	0.794
Cleaning-agent	11(15.9%)	2(13.3%)	2(14.3%)	1(33.3%)	6(16.2%)	0.805
Seasonal	5(7.2%)	1(6.7%)	2(14.3%)	1(33.3%)	1(2.7%)	0.059
Handwashing (times/day)						
<=10	21(30.40%)	3(20.0%)	5(35.7%)	1(33.3%)	12(32.4%)	
>10	48(69.60%)	12(80.0%)	9(64.3%)	2(66.7%)	25(67.6%)	
Duration Gloves use(hours/day)						
<=1	13(18.80%)	3(20.0%)	4(28.6%)	0	6(16.2%)	
>=4	31(44.90%)	6(40.0%)	7(50.0%)	2(66.7%)	16(43.2%)	
2-3hours	25(36.20%)	6(40.0%)	3(21.4%)	1(33.3%)	15(40.5%)	
Wet-Work Hours/day						
<=1	44(63.80%)	6(40.0%)	10(71.4%)	1(33.3%)	27(73.0%)	
>=2	25(36.20%)	9(60.0%)	4(28.6%)	2(66.7%)	10(27.0%)	
Symptoms reported						
Burning	**5(7.2%)**	3(20.0%)	1(7.1%)	0	1(2.7%)	0.165
Erythema	16(23.2%)	5(33.3%)	5(35.7%)	0	6(16.2%)	0.254
Erosion	2(2.9%)	1(6.7%)	0	1(33.3%)	0	0.038
Excoriation	1(1.4%)	0	0	1(33.3%)	0	0.043
Dryness	4(5.8%)	1(6.7%)	0	0	3(8.1%)	0.838
Hyperpigmentation	1(1.4%)	0	0	1(33.3%)	0	0.043
Itching	47(68.1%)	11(73.3%)	7(50.0%)	2(66.7%)	27(73.0%)	0.426
Scaling/exfoliation	32(46.4%)	4(26.7%)	8(57.1%)	0(0.0%)	20(54.1%)	0.098
Rashes	2(2.9%)	0	0	0	2(5.4%)	0.99
Vesicles	14(20.30%)	3(20%)	2(14.3%)	2(66.7%)	7(18.9%)	0.268
Thickening	1(1.4%)	0	1(7.1%)	0	0	0.268
Fissuring	8(11.6%)	1(6.7%)	2(14.3%)	0	5(13.5%)	0.848
Papules	18(26.10%)	4(26.7%)	2(14.3%)	1(33.3%)	10(27%)	0.686
Occupation→ Disease response with work:						
Improvement in disease after stopping work	62(89.9%)	14(93.3%)	11(78.6%)	2(66.7%)	35(94.6%)	0.134
Recurrence on restarting work	60(87%)	14(93.3%)	11(78.6%)	2(66.7%)	33(89.2%)	0.396
Interval between starting work and	4.0(1.0,48.0)*	2.0(0.8,26.5)*	13.0(0.9, 48)*	3(1.5,13.5)*	8.0(1,48)*	0.645

Table no.3: Odds ratio for hand dermatitis severity

	HECSI Category		
Predictors	*Odds Ratios*	*CI*	*P*
(Intercept)	3.70	0.00–50936.25	0.771
Age	0.85	0.59–1.11	0.307
Hand Washing(>10times/day)	4.25	0.58–92.06	0.224
Sex [m]	0.88	0.13–7.59	0.902
Duration Gloves Category[>=4]	2.61	0.49–15.70	0.264
Wet Work Hours Category[>=2]	0.24	0.01–2.00	0.255
Observations	69		
R^2 Tjur	0.105		

Table no.4: Association between Site of Involvement, morphology and Occupation of cases:

Site of involvement	Total no. n=69	Sanitation worker	Doctor	Laboratory Technician	Nursing officer	p-value
Palm	19(27.5%)	5(33.3%)	6(42.9%)	1(33.3%)	7(18.9%)	0.27
Fingers	36(52.2%)	7(46.7%)	8(57.1%)	2(66.7%)	19(51.4%)	0.938
Tip of fingers	15(21.7%)	2(13.3%)	4(28.6%)	0	9(24.3%)	0.634
Palmar aspect of finger	31(44.9%)	6(40.0%)	7(50.0%)	2(66.7%)	15(40.5%)	0.282
Dorsal aspect of finger	25(36.2%)	4(26.7%)	8(57.1%)	2(66.7%)	11(29.7%)	0.162
Dorsum of hand	35(50.7%)	8(53.3%)	6(42.9%)	1(33.3%)	20(54.1%)	0.846
Web spaces	39(56.5%)	8(53.3%)	10(71.4%)	1(33.3%)	20(54.1%)	0.591
Morphology of lesion						
Erythema	34(49.3%)	6(40.0%)	7(50.0%)	2(66.7%)	19(51.4%)	0.796
Scaling	41(59.4%)	7(46.7%)	11(78.6%)	1(33.3%)	22(59.5%)	0.26
Fissuring	11(15.9%)	3(20.0%)	3(21.4%)	2(66.7%)	3(8.1%)	0.048
Papules	12(17.4%)	2(13.3%)	2(14.3%)	0	8(21.6%)	0.863
Vesiculation	15(21.7%)	3(20.0%)	3(21.4%)	1(33.3%)	8(21.6%)	0.964
Lichenification	6(8.7%)	1(6.7%)	2(14.3%)	1(33.3%)	2(5.4%)	0.202