

Occupational Contact Dermatitis among Health Care Workers in Yangon General Hospital

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Health care workers (HCWs) are at high risk of developing occupational contact dermatitis (OCD) because they are daily exposed to various irritants and allergens in their workplace, but the extent of the problem varies between countries and regions. This study was carried out on HCWs at Yangon General Hospital (YGH) from October 2017 to September 2018. A cross-sectional hospital-based descriptive study was designed to assess the prevalence, demographic characteristic, risk factors, clinical patterns, responsible irritants and allergens for development of OCD in HCWs. A self-administered questionnaire was distributed to all health care workers (except administrative officers and staff) in YGH and each subject who returned a positive response to this questionnaire was asked for examination and patch testing with 20 allergens and additionally with their own contactants appropriately diluted. The total study population was 548 HCWs and the overall prevalence of occupational contact dermatitis in this study was 30.5% (167/548). A total of 82 participants underwent patch testing. Final diagnoses of the HCWs with OCD were allergic contact dermatitis (ACD) 51.2%, irritant contact dermatitis (ICD) 36.7% and contact urticaria 12.1%. The most common allergens were antiseptics/preservative (23.2%), cobalt/nickel (20.7%), rubber chemicals (15.8%) and hand cleanser excipients (7.3%), respectively. The common irritants for HCWs were water/wet work (76.7%), heat and/or sweating (63.3%), soaps and liquid detergents (56.7%), methylated spirit (16.7%), and floor/instrument disinfectants (10%). Natural rubber latex might be the possible culprit for HCWs with contact urticaria. This study is an important first step towards the development of occupational dermatology in Myanmar and it is important to raise awareness among HCWs about the current spectrum of allergens and irritants encountered in the health care setting.

Keywords: Occupational contact dermatitis, Health care workers, Allergic contact dermatitis, Irritant contact dermatitis, Patch test

INTRODUCTION

Occupational skin diseases are any abnormal conditions of the skin caused or aggravated by substances or processes associated with the work environment.¹ Occupational contact dermatitis (OCD) is the most frequent cause of occupational skin diseases.² and health care workers (HCWs) are the most commonly affected occupational group.^{3, 4} HCWs are at

high risk of developing OCD particularly affecting the hands, because they are daily exposed to disinfectants, various medications, metal instruments and frequent hand washing, as well as wearing of occlusive glove, which of all may cause irritant and/or allergic contact

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DOI: <https://doi.org/10.34299/mhsrj.009107>

dermatitis.^{5, 7} OCD in HCWs can have a chronic and relapsing course and the consequences include sick leave, loss of job, disability resulting from chronicity and socio-economic impact.⁸ It is important for doctors and health care professionals to recognize OCD and work-related diseases among their patients. Early detection and intervention can prevent or minimize the morbidity and disability from these diseases. Therefore, in order to improve the knowledge about the prevalence, exposure characteristics and current spectrum of allergens encountered in health-care setting, this study was carried out among health care workers in Yangon General Hospital. This study was conducted to determine prevalence of occupational contact dermatitis in health care workers at Yangon General Hospital, to describe the demographic characteristics, risk factors and clinical patterns of occupational contact dermatitis and to detect responsible irritants and allergens for development of occupational contact dermatitis.

MATERIALS AND METHODS

A cross-sectional hospital-based descriptive study was designed and the study period was from October 2017 to September 2018. All health care workers (except administrative officers and staff) working in Yangon General Hospital who are more likely exposed to disinfectants, antiseptic solutions, glove wearing, drugs and medical devices were included in this study. A self-administered questionnaire (based on the Nordic Occupational Skin Questionnaire.⁹) with a consent form was distributed to all health care workers (except administrative officers and staff) in YGH at their respective wards. Each subject who returned a positive response to these questions was asked for face-to-face interview, examination and patch testing. IQ Ultimate chambers and 20 allergens (healthcare-specific allergens and some baseline allergens) and additionally with their own contactants appropriately diluted were used for patch test.¹⁰ Allergens and chambers were sourced from Chemotechnique Diagnostics (Vellinga, Sweden). Patches were

applied to the upper back for 48 hours and readings were performed on day 2 and day 4 according to the International Contact Dermatitis Research Group (ICDRG) criteria.¹¹ After patch test procedure, patch test materials were disposed properly according to medical waste disposal guideline. The work-relatedness of their contact dermatitis was determined by Mathiascriteria in this study.¹²

Ethical considerations

This study was carried out with the approval of the Ethics Review Committee, Department of Medical Research, Myanmar.

RESULTS

A total of 548 HCWs responded to the questionnaire. Of the 548 respondents, 167 claimed to have occupational contact dermatitis. The overall prevalence of self-reported occupational contact dermatitis in this study was 30.5% (167/548) (Table 1).

Table 1. Prevalence of occupational contact dermatitis in health care worker (HCWs)

Healthcare professions	Total respondents HCWs (n=548)	HCWs with OCD (n=167)	Overall prevalence (%)
Nurses	274	97	30.5
Doctors	175	56	
Technicians	24	7	
Workers	58	3	
Physiotherapists	12	2	
Dentists	5	2	

Out of 167 HCWs with OCD, 82 participants gave consent to proceed clinical examination and patch testing but, 85 HCWs refused to complete participation in this study because they were inconvenient to follow-up visits for patch test reading. Of the 82 HCWs with OCD, 75 (91.5%) were female and 7 (8.5%) were male. Regarding age group, 73.2% were <40 year of age and 26.8% were ≥40. Personal history of atopy was evaluated in 19 HCWs (23.2%). Hand dermatitis (75.6%) was the most common presentation in this study and second most common location of dermatitis was the face (8.5%) and extremities (8.5%), respectively. The diagnosis of the study population was made based on history,

clinical examination and patch test findings and their clinical diagnoses are shown in Figure 1.

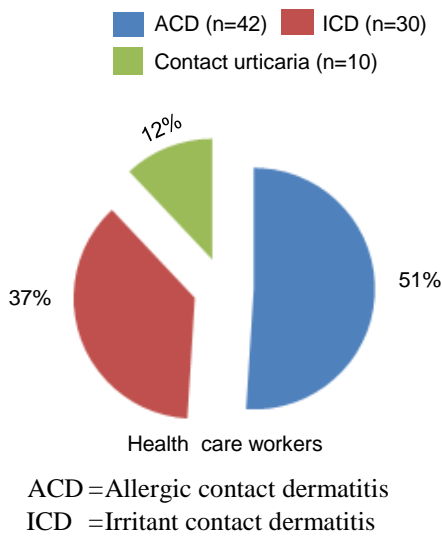


Fig. 1. Clinical diagnosis of health care workers (HCWs) with occupational contact dermatitis (OCD) (n=82)

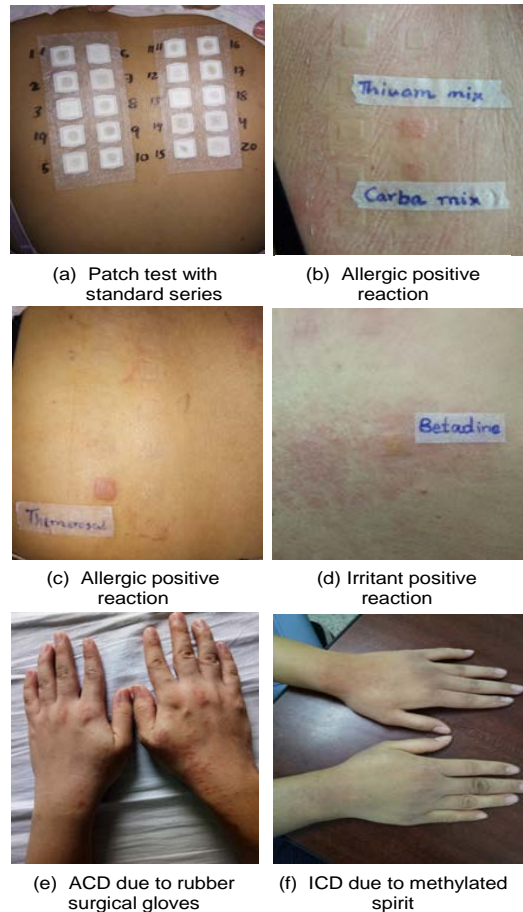
Table 2. Frequency of patch test positive allergen in ACD group

Group of allergens	Number of patients	%
Antiseptics/preservative	19	23.2
Metals	17	20.7
Rubber chemicals	13	15.8
Hand cleanser excipients	6	7.3
Others	3	3.6

In this study, allergic contact dermatitis (ACD) was diagnosed in 51.2% (42/82) of study population. Major allergen groups of patch test positive were antiseptic/ preservatives (23.2%) [thimerosal (12.2%), formaldehyde (7.3%) and glutaraldehyde (1.2%), chloroxylenol (1.2%) and benzalkonium chloride (1.2%)], metals (20.7%) [cobalt 11%), nickel (8.5%) and potassium dichromate (1.2%)] and rubber chemicals (15.8%) [carba mix (8.5%), thiuram mix (4.9%) and mercapto mix (2.4%)]. Other positive allergens were fragrance mix I (3.7%), myroxylon pereirae resin (2.4%), p-phenylenediamine (2.4%), colophonium (1.2%) and cocamidopropyl betaine (1.2%) (Table 2). Positive reactions to more than one allergen in one patient were allowed. There was no positive reaction to

quaternium-15, fragrance mix II, methylchloroisothiazolinone+methylisothiazolinone, and 2-mercaptobenzothiazole (MBT) in this study.

In patch testing of patients' own products, 13 products were patch tested in 8 HCWs. Most participants could not exactly mention their culprit agents because they often exposed a wide variety of irritants and allergens in workplace. Among these 13 products, 5 were rubber gloves, 4 were floor/instrument disinfectants, 3 were hand sanitizers and 1 was x-ray film developer and they were appropriately diluted (0.1% in aq. for floor/instrument disinfectants and x-ray film developer, 1% in aq. for hand sanitizers; 'as is' for rubber gloves). Only 3 irritant reactions (IR) to 3 patients' products (steranios 2%, powdered NRL gloves and betadine hand wash) were noted (Figure 2).



ACD = Allergic contact dermatitis
ICD = Irritant contact dermatitis

Fig. 2. Clinical pictures

Among 82 OCD patients, 37% (30/82) were found to be ICD. Water/wet work was assessed as being the causative irritant in 76.7% (23/30), and heat and/or sweating due to prolonged occlusive gloves wearing in 63.3% (19/30). Soaps and liquid detergents were the cause in 56.7% (17/30), methylated spirit in 16.7% (5/30), and floor and instrument disinfectants in 10% (3/30) (Figure 2). In this study, diagnosis of contact urticaria was made clinically and it might be due to natural rubber latex allergy. Prick test and natural rubber latex specific serum Inge test were not performed in this study.

DISCUSSION

This study stated the prevalence of OCD among HCWs at 30.5%; this figure was comparable with previously reported international data.^{13, 16} In this study, the overall prevalence of OCD in HCWs was calculated on self-administered questionnaire. The validity of use of self-administered questionnaire for prevalence of occupational skin diseases was supported by previous studies.^{8, 17, 18}

By comparison, the prevalence of OCD among different healthcare professions was surprisingly low (5.2%) in general workers (cleaners). It is possible due to too little knowledge of this population to complain or be aware of the symptoms of occupational skin diseases. Most of HCWs with OCD in this study were female (91.5%), reflecting the sex distribution among the all HCW population. Nearly one fourth (23.2%) of the HCWs evaluated had personal history of atopy. Atopy has been imposed as both a risk factor and prognostic factor for those with OCD.³ Approximately 75% of the study population had OCD involving the hands. This is not surprising because most irritants and allergens such as hand cleansers, antiseptic solution and glove chemicals primarily contact the hands.

In this study, ACD was more frequent than ICD (51.2% vs 36.7%). Similarly, ACD was more common in previous international studies.^{19, 21} but, in one Australian retrospective

analysis and one Italian study, ICD was more common than ACD.^{22, 23} There are many reasons for this variability in reported frequencies including different geographical area, exposure patterns, patients selection bias and patch testing. Regarding ACD and allergens, the most common allergens in this study were antiseptics/preservative, rubber chemicals, cobalt/nickel and hand cleanser excipients (Table 2).

This spectrum of allergens is generally in accordance with international data.^{7, 19, 22, 24} When studying the specific allergen, it was found that thimerosal (12.2%) was the commonest allergen encountered in this study. Thimerosal is an antiseptic and disinfectant agent that is used in soap-free cleansers, contact lens solutions, vaccines, ophthalmic medications and cosmetics.²⁵ The increased rate of thimerosal allergy in our data might be attributed either to contact with thimerosal containing products (e.g. soap-free cleansers, contact lens solutions, ophthalmic medications) or to possibly related to prior vaccination experiences, but it was difficult to definitely establish its clinical relevance.

In this study, 20.7% of HCWs with OCD had positive reactions to nickel or cobalt. Such a finding of allergy to metal (20.7%) in the present study was presumably caused by contact with nickel-plated instruments at the work-place (e.g. surgical instruments), although today's surgical instruments are made of stainless steel and would not be expected to release much nickel.²³ In addition, sensitization to nickel, especially in female HCWs, is thought to be mainly non-occupational, e.g. from fancy, cheap jewellery. Therefore, further studies are necessary to determine the clinical relevance of metal sensitivity in HCWs by measurement of nickel or chromium cobalt extent in all metal instruments at the hospital.

Rubber chemicals are important occupation allergens in HCWs and the increased use of rubber latex gloves is one of the most important routes of sensitization to them. Thiurams, carbamates, guanidines and thioureas may all serve as sulfur donors and they are used as accelerators in the process of

rubber vulcanization.¹⁹ Two European studies stated that thiurams were the leading allergens in occupational rubber glove allergy and its prevalence peaked in the 1990s.^{26, 27} Since then, the glove manufacturers have reduced the use of thiurams in rubber glove production and carbamate and benzo-thiazole derivatives are more commonly used.²⁰ This could explain why the higher positive patch test response to carba mix than to thiuram mix (8.5% vs 4.9%) was found in this study.

On analyzing the testing with patients' products, only 3 patients' products (steranios 2%, powdered NRL glove and betadine hand wash) showed irritant reaction in this study. This finding was too small to make significant conclusion or recommendation about the testing with patients' products and weak points where a large number of products could not be tested and lack serial dilution of the products while testing. Although the results were too small to be significant, patch testing with products from the patients' workplace is mandatory because not all potential occupational allergens are covered by commercially available patch test series. Concerning of adverse effects of patch testing, there was no significant complication of patch test in the study apart from adhesive tape reactions in some patients. But, these reactions were transient and subsided themselves without any treatment. So, patch test is safe method for allergen identification and all HCWs with contact dermatitis should undergo patch testing to confirm or rule out the presence of allergy to the substances which they are exposed in day to day working.

Frequent hand washing with harsh hand sanitizers as well as the wearing of protective gloves that are occlusive and may cause friction to the skin are known risk factors for the development of ICD in HCWs.⁸ As shown in the results, HCWs with ICD were more likely to use soaps, detergents and antiseptics frequently and to wear gloves daily for a prolonged duration. Besides, pre-existing ICD with fissuring skin leads to increased permeability and can lead to

sensitization with resultant allergic contact dermatitis.²⁸ So, preventive measures for ICD are important role in management of ICD in HCWs. Most of HCWs in the study often washed their hands with water and soaps and the usage of waterless hand rub/gel was low. They are extremely effective in infection control for visibly unsoiled hand and are associated with very low rates of cutaneous reactions.^{6, 29, 30}

Moreover, regular use of skin barrier (moisturizer) creams has a preventive role for HCWs with occupational hand dermatitis. Held and Jorgensen suggested that the use of a moisturizer under occlusive gloves may diminish irritation and risks of ACD from exposure to both the glove itself and to substances, such as detergents, used thereafter. Moisturizers create a barrier that protects the skin against friction from gloves, invasion of glove allergens and damage from irritants.³¹ But, it was surprising that none of HCWs in the study population used the skin barrier (moisturizer) cream at the workplace. Skin care programs including education and advice about contact dermatitis, about good hand washing and drying techniques, about glove use and about the use of barrier creams should be undertaken for all HCWs.

Conclusion

This study highlighted that HCWs are predisposed persons to develop Occupational contact dermatitis and the extent of the problem can vary between countries and regions. This study is an important first step towards the development of occupational dermatology in this country and the data obtained from this study would be useful for formulating the proper reporting system, management guidelines and implementation of proper preventive measures of contact dermatitis in health care workers. It is also important to raise awareness among HCWs about the current spectrum of allergens and irritants encountered in the health care setting. In addition, further studies should explore areas of other occupation groups such as construction workers, hair dressers and food handlers.

Competing interests

The authors declare that they have no competing interests.

ACKNOWLEDGEMENT

This study was supported in part by DMR External Grant. We are grateful to all the health care workers in Yangon General Hospital who participated in our study.

REFERENCES

1. Honari G, Taylor JS & Sood A. Occupational skin diseases due to irritants and allergens. In: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, Wolff K, editors. *Fitzpatrick's Dermatology in General Medicine*. 8th ed. New York: McGraw-Hill; 2012. p. 2611-2622.
2. Wilkinson SM. Occupational dermatoses. In: Bologna JL, Jorizzo JL, Schaffer JV, editors. *Dermatology*. 3rd ed. Canada: Elsevier; 2012. p. 261-272.
3. Coman G, Zinsmeister C & Norris P. Occupational contact dermatitis: Workers' compensation patch test results of Portland, Oregon, 2005-2014. *Dermatitis* 2015; 26(6): 276-283.
4. Carøe TK, Ebbelhøj N & Agner T. A survey of exposures related to recognized occupational contact dermatitis in Denmark in 2010. *Contact Dermatitis* 2013; 70(1): 56-62.
5. Behroozy A & Keegel TG. Wet-work exposure: A main risk factor for occupational hand dermatitis. *Safety and Health at Work* 2014; 5(4): 175-180.
6. Boyce JM & Pittet D. Guideline for hand hygiene in health-care settings. Recommendations of the healthcare infection control practices advisory committee and the hipac/shear/apic/idsa hand hygiene task force. *American Journal of Infection Control* 2002; 30(8): S1-S46.
7. Schnuch A, Uter W, Geier J, Frosch PJ & Rustemeyer T. Contact allergies in healthcare workers. Results from the IVDK. *Acta Dermato-Venereologica* 1998; 78(5): 358-363.
8. Ibler KS, Jemec GBE & Agner T. Exposures related to hand eczema: A study of healthcare workers. *Contact Dermatitis* 2012; 66(5): 247-253.
9. Susitaival P, Flyvholm MA, Meding B, Kanerva L, Lindberg M, Svensson A, *et al*. Nordic Occupational Skin Questionnaire (NOSQ-2002): A new tool for surveying occupational skin diseases and exposure. *Contact Dermatitis* 2003; 49(2): 70-76.
10. Frosch PJ, Geier J, Uter W & Gossens A. Patch Testing with the patients' own products. In: Johansen JD, Frosch PJ, Lepoittevin J-P, editors. *Contact Dermatitis*. 5th ed. Berlin Heidelberg: Springer-Verlag; 2011. p.1107-1119.
11. Lachapelle J-M & Maibach HI. Patch Testing Methodology. In: Lachapelle J-M, Maibach HI, editors. *Patch Testing and Prick Testing: A Practical Guide Official Publication of the ICDRG*. 3rd ed. Berlin Heidelberg: Springer-Verlag; 2012. p.35-77.
12. Mathias CG. Contact dermatitis and workers compensation: Criteria for establishing occupational causation and aggravation. *Journal of the American Academy of Dermatology* 1989; 20(5Pt.1): 842-848.
13. Ibler KS, Jemec GBE, Flyvholm MA, Diepgen TL, Jensen A & Agner T. Hand eczema: Prevalence and risk factors of hand eczema in a population of 2274 health care workers. *Contact Dermatitis* 2012; 67(4): 200-207.
14. Lee SW, Cheong SH, Byun JY, Choi YW & Choi HY. Occupational hand eczema among nursing staffs in Korea: Self-reported hand eczema and contact sensitization of hospital nursing staffs. *Journal of Dermatology* 2013; 40(3): 182-187.
15. Smith DR, Ohmura K & Yamagata Z. Prevalence and correlates of hand dermatitis among nurses in a Japanese teaching hospital. *Journal of Epidemiology* 2003; 13(3): 157-161.
16. Lampel HP, Patel N, Boyse K, O'Brien SH & Zirwas MJ. Prevalence of hand dermatitis in inpatient nurses at a United States hospital. *Dermatitis* 2007; 18(3):140-142.
17. Kurpiewska J, Liwkowicz J & Benczek K. A survey of work-related skin disease in different occupations in Poland. *International Journal of Occupational Safety and Ergonomics* 2011; 17(2): 207-214.
18. Champion KM. A survey of occupational skin disease in UK health care workers. *Occupational Medicine* 2015; 65(1): 29-31.
19. Warshaw EM, Schram SE, Maibach HI, Belsito DV, Marks Jr JG, Fowler Jr JF, *et al*.

- Occupation-related contact dermatitis in North American healthcare workers referred for patch testing: Cross-sectional data, 1998 to 2004. *Dermatitis* 2008; 19(5): 261-274.
20. Kadivar S & Belsito DV. Occupational dermatitis in health care workers evaluated for suspected allergic contact dermatitis. *Dermatitis* 2015; 26(4): 177-183.
 21. Jain A, Chander R & Mendiratta V. Contact dermatitis in nurses and paramedicals in a tertiary care hospital of northern India. *Indian Journal of Dermatology, Venereology and Leprology* 2010; 76(5): 566-567.
 22. Higgins CL, Palmer AM, Cahill JL & Nixon RL. Occupational skin disease among Australian healthcare workers: A retrospective analysis from an occupational dermatology clinic, 1993-2014. *Contact Dermatitis* 2016; 75(4): 213-222.
 23. Nettis E, Colanardi MC, Soccio AL, Ferrannini A & Tursi A. Occupational irritant and allergic contact dermatitis among health care workers. *Contact Dermatitis* 2002; 46(2): 101-107.
 24. Molin S, Bauer A, Schnuch A & Geier J. Occupational contact allergy in nurses: results from the information network of Departments of Dermatology 2003-2012. *Contact Dermatitis* 2014; 72(3): 164-171.
 25. Jacob SE & Herro EM. Clinical Guide - Top 88 Allergens. In: *Practical Patch Testing and Chemical Allergens in Contact Dermatitis*. 1st ed. London, Springer Verlag; 2013. p.112.
 26. Gibbon KL, Mcfadden JP, Rycroft RJG, Ross JS, Chinn S & White IR. Changing frequency of thiuram allergy in healthcare workers with hand dermatitis. *British Journal of Dermatology* 2001; 144(2): 347-350.
 27. Geier J, Lessmann H, Uter W & Schnuch A. Occupational rubber glove allergy: Results of the Information Network of Departments of Dermatology (IVDK), 1995-2001. *Contact Dermatitis* 2003; 48(1): 39-44.
 28. Zhai H & Maibach HI. Skin occlusion and irritant and allergic contact dermatitis: An overview. *Contact Dermatitis* 2001; 44(4): 201-206.
 29. Graham M, Nixon R, Burrell LJ, Bolger C, Johnson PDR & Grayson ML. Low rates of cutaneous adverse reactions to alcohol-based hand hygiene solution during prolonged use in a large teaching hospital. *Antimicrobial Agents and Chemotherapy* 2005; 49(10): 4404-4405.
 30. Jungbauer FHW, van der Harst JJ, Groothoff JW & Coenraads PJ. Skin protection in nursing work: Promoting the use of gloves and hand alcohol. *Contact Dermatitis* 2004; 51(3): 135-140.
 31. Held E & Jørgensen LL. The combined use of moisturizers and occlusive gloves: an experimental study. *American Journal of Contact Dermatitis*. 1999; 10(3): 146-152.