ORIGINAL RESEARCH

Contact Dermatitis among Hospital Cleaners in Dar es Salaam: Prevalence and Associated Factors

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Abstract

Background

Cleaners are a high-risk group for contact dermatitis in healthcare settings due to frequent exposure to cleaning agents, gloves, and wet work, yet they remain understudied in Tanzania. This study investigated the prevalence of contact dermatitis and its associated factors among hospital cleaners in Dar es Salaam, Tanzania.

Methods

A cross-sectional study was conducted between March and July 2022 among hospital cleaners from three regional referral hospitals and one national hospital. Data were collected using the Standardized Nordic Occupational Questionnaire. Modified Poisson regression was applied to estimate prevalence ratios (PRs) with 95% confidence intervals (CIs). Contact dermatitis was defined as the presence of two or more skin symptoms affecting the hands, wrists, or forearms within the past 12 months.

Results

A total of 323 cleaners took part in the study. The median age was 26 years (range 18-64), and 65% were female. The prevalence of contact dermatitis was 48.9%. The most frequently reported symptoms were itching (48.6%), dry skin (44.6%), and rashes (22.0%). Work-related factors positively associated with contact dermatitis included use of floor-cleaning products (aPR = 1.70, 95% CI: 1.18–2.44), bleach (aPR = 1.64, 95% CI: 1.22–2.22), handwashing >10 times a day (aPR = 1.63, 95% CI: 1.12–2.35), and latex glove use (aPR = 1.61, 95% CI: 1.29–2.01). Prevalence varied across hospitals. Individual factors such as age, sex, smoking, and allergy history were not significantly associated with disease.

Conclusions

Contact dermatitis is highly prevalent among hospital cleaners in Dar es Salaam, with its occurrence mainly associated with occupational exposures rather than individual susceptibility. Preventive measures should prioritize safer cleaning products, improved hand hygiene practices, appropriate glove use, and tailored skin protection programs.

Keywords: Contact dermatitis, hospital cleaners, occupational exposure, bleach, handwashing, latex gloves, Tanzania

Introduction

Skin diseases are among the most common occupational illnesses globally, with contact dermatitis being the most frequent type[1]. Healthcare workers (HCWs) are particularly vulnerable due to repeated exposure to cleaning agents, disinfectants, gloves, and intensive hand hygiene practices[2–5]. Beyond health impacts, contact dermatitis contributes to absenteeism, reduced productivity, and increased healthcare costs[6,7].

Within healthcare facilities, cleaners represent a high-risk group[8]. Their daily work involves extensive "wet tasks" and frequent contact with irritants such as chlorine-based disinfectants, detergents, and latex gloves, all of which can damage the skin barrier and cause irritant or allergic dermatitis[2,9]. Despite this elevated risk, hospital cleaners remain relatively understudied compared to other HCWs such as nurses[3]. Studies from Ethiopia and Southern Africa report high prevalence rates of contact dermatitis among hospital workers exposed to cleaning agents, ranging from 12% to over 50% depending on the methods and setting[3,8,10].

A broad range of host and work-related factors have been linked to contact dermatitis among HCWs [11]. These include individual characteristics such as younger age, female sex, and a history of atopic diseases[5,7,12] as well as occupational exposures such as frequent handwashing, prolonged glove use and contact with disinfectants[3,4,10,11]. The COVID-19 pandemic further amplified these risks due to intensified infection-control measures which markedly increased wet work and chemical exposure, resulting in widespread reports of occupational skin disorders among healthcare staff[13].

In Tanzania, evidence on occupational contact dermatitis remain scarce, particularly among hospital cleaners, despite the rapid expansion of outsourced cleaning services in major public hospitals[2,3]. This lack of data constrains the development of preventive interventions for this neglected workforce. To address this gap, the present study aimed to determine the prevalence of contact dermatitis and identify its associated individual and work-related risk factors among hospital cleaners in four referral hospitals in Dar es Salaam, Tanzania.

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Methods

Study design, population and sampling

A cross-sectional study was conducted between March and July 2022 among cleaners working in three regional referral hospitals and one national hospital in Dar es Salaam, Tanzania. These hospitals are the largest public health facilities in the region and receive referrals from lower-level health institutions. Cleaning services in these facilities are outsourced to private companies, which employ the cleaners. Given the relatively small study population (N = 354), all cleaners with at least one year of work experience were approached to participate in the study. Cleaners absent during the entire data collection period due to long-term sick or maternity leave were excluded.

Data collection

Data were collected using the Standardized Nordic Occupational Questionnaire (SNOQ) adapted and translated into Kiswahili, then back-translated for accuracy and consistency. Data collection was conducted in Kiswahili by trained research assistants. The instrument covered socio-demographic characteristics, work-related factors (cleaning agents use, glove use, cleaning tasks and hand hygiene practices), and skin symptoms. The SNOQ has been applied in multiple countries, including Tanzania and Ethiopia, and has shown strong validity and reliability in face-to-face administration[10,14]. Before the main survey, the tool was piloted among 15 cleaners in a different hospital to evaluate its appropriateness, and modifications were made accordingly. Contact dermatitis was defined as the presence of at least two skin symptoms (redness, dry skin, vesicles, itching, burning, or rashes) within the past 12 months affecting the hands, wrists or forearms[3].

Data management and analysis

Data were analysed using STATA version 17 (StataCorp, College Station, TX, USA). Initial screening was performed to identify and correct missing values or outliers. Descriptive comparisons of categorical variables, including sex, history of allergy, smoking status, duration of cleaning work, and education level, across the hospitals were conducted using the Chi-squared (χ^2) or Fisher's exact tests as appropriate. For age, which was treated as a continuous variable, the Kruskal–Wallis test was applied to compare the median age of participants across the four hospitals. Associations between contact dermatitis and explanatory factors were examined using univariate and multivariable modified Poisson regression models, adjusted for sex, age, and education level. Statistical significance was set at $p<0.05$.

Ethical considerations

The study received ethical clearance from the Muhimbili University of Health and Allied Sciences (MUHAS) Institutional Review Board (Ref. No: MUHAS-REC-05-2022-1176). Authorization to carry out the research was additionally obtained from each participating hospital. All participants provided written informed consent before data collection commenced.

Results

Characteristics of study participants

A total of 323 hospital cleaners participated in the study (response rate 91.2%) (Table 1). The median age was 26 years (range 18-64), and 65% were female. Most participants (n=189; 58.5%) had completed only primary education, and only 5 (1.5%) had attained education beyond secondary school. More than half of the cleaners (n=168; 52.0%) had been working in hospital cleaning for one year or less. Current smoking (6.8%) and allergy history (6.2%) were uncommon.

Skin symptoms

The prevalence of contact dermatitis, defined as experiencing two or more skin symptoms affecting the hands, wrists, or forearms in the past 12 months, was 48.9% (95% Cl: 43.5 – 54.4). The most frequently reported symptoms were itching (48.6%), dry skin (44.6%), and rashes (22.0%) (Figure 1).

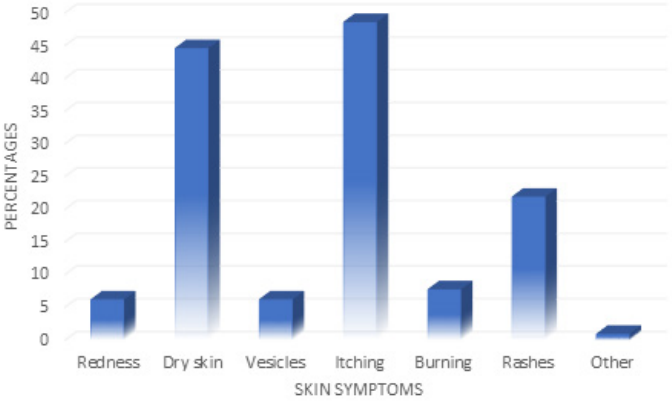

Figure 1: Skin symptoms reported by hospital cleaners (n=323)

Individual factors associated with contact dermatitis

Table 2 summarises the results of the univariate and multivariable modified Poisson regression analyses assessing the association between contact dermatitis and individual factors. Age was not significantly associated with contact dermatitis, although cleaners aged 36–55 years had a higher prevalence compared with those aged 18–35 years (adjusted prevalence ratio [aPR] = 1.28, 95% CI: 0.97–1.68). Sex was also not significantly associated, with similar prevalence observed among female and male cleaners (aPR = 1.06, 95% CI: 0.83–1.35). Likewise, level of education was not a predictor of contact dermatitis; participants with secondary or higher education had prevalence ratios close to one compared with those who had completed only primary education. Neither a personal history of allergy (aPR = 1.13, 95% CI: 0.73–1.75) nor current smoking (aPR = 0.95, 95% CI: 0.58–1.56) was associated with an increased prevalence of contact dermatitis. Overall, none of the examined individual factors showed a statistically significant association with contact dermatitis in this population. Furthermore, no significant association was observed between contact dermatitis and non-work-related practices, including laundry, gardening, the use of cosmetics or cleaning agents at home (see Supplementary Table 1).

Work-related factors associated with contact dermatitis

The prevalence of contact dermatitis was significantly higher among cleaners in Hospital 2 (aPR = 2.22, 95% CI: 1.29–3.79) and Hospital 3 (aPR = 1.81, 95% CI: 1.01–3.23) (Table 3). Duration of employment as a hospital cleaner was not significantly associated with contact dermatitis. Higher odds of contact dermatitis were observed among cleaners who reported using floor cleaning products (aPR = 1.70, 95% CI: 1.18–2.44) and bleach (aPR = 1.64, 95% CI: 1.22–2.22). By contrast, the use of glass-cleaning products (aPR = 1.29, 95%

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Table 1: Characteristics of study participants (n = 323)

Variable		Overall	Hospital 1	Hospital 2	Hospital 3	Hospital 4	p-value
			n (%)	n (%)	n (%)	n (%)	(χ^2)
		n = 323	194 (60.1)	53 (16.4)	39 (12.1)	37 (11.4)	
Sex	Male	113 (35.0)	83 (42.8)	12 (22.6)	12 (30.8)	6 (16.2)	0.002
	Female	210 (65.0)	111 (57.2)	41 (77.4)	27 (69.2)	31 (83.8)	
Age (years)	Median (range)	26 (18-64)	26 (18-55)	29 (18-61)	29 (19-64)	26 (20-51)	0.012+
Education	Primary	189 (58.5)	104 (53.6)	32 (60.4)	26 (66.7)	27 (73.0)	0.243*
	Secondary	129 (40.0)	87 (44.9)	20 (37.7)	12 (30.8)	10 (27.0)	
	Certificate	3 (0.9)	2 (1.0)	1 (1.9)	0 (0)	0 (0)	
	Diploma	2 (0.6)	1 (0.5)	0 (0)	1 (2.5)	0 (0)	
Cleaning duration in hospital setting (years)	≤ 1	168 (52.0)	116 (59.8)	28 (52.8)	11 (28.2)	13 (35.1)	0.001
	2 – 3	87 (26.9)	44 (22.7)	14 (26.4)	19 (48.7)	10 (27.0)	
	>3	68 (21.1)	34 (17.5)	11 (20.8)	9 (23.1)	14 (37.9)	
Allergy history		20 (6.2)	13 (6.7)	4 (7.6)	2 (5.1)	1 (2.7)	0.871*
Current smoking		22 (6.8)	12 (6.2)	3 (5.7)	7 (18.0)	0 (0)	0.020*

+ Kruskal-Wallis test; *Fisher's exact test

Table 2: Individual factors associated with contact dermatitis

Individual factors	n (%)	Univariate		Multivariable	
		PR (95% CI)	p-value	PR (95% CI)	p-value
Age (years)*					
18 to 35	258 (79.9)	Ref			
36 to 55	62 (19.2)	1.24 (0.97-1.59)	0.092	1.28 (0.97-1.68)	0.082
55 to 64	3 (0.9)	0.71 (0.14-3.55)	0.677	0.76 (0.16-3.72)	0.734
Sex**					
Male	113 (35.0)	Ref			
Female	210 (65.0)	1.10 (0.86-1.40)	0.452	1.06 (0.83-1.35)	0.668
Education***					
Primary	189 (58.5)	Ref			
Secondary or higher	129 (41.5)	1.04 (0.83-1.30)	0.743	1.10 (0.87-1.41)	0.427
Personal history of allergy					
No	303 (93.8)	Ref			
Yes	20 (6.2)	1.13 (0.75-1.72)	0.552	1.13 (0.73-1.75)	0.597
Current smoking					
No	301 (93.2)	Ref			
Yes	22 (6.8)	0.93 (0.58-1.48)	0.745	0.95 (0.58-1.56)	0.825

Each prevalence ratio is derived from a separate regression model, presented both unadjusted and adjusted for age, sex, and level of education, unless otherwise specified.

*: Adjusted for sex and level of education; **: Adjusted for age and level of education; ***: Adjusted for sex and age

CI: 0.80–2.08) was not associated with increased prevalence. Frequent handwashing was significantly associated with contact dermatitis (aPR = 1.63, 95% CI: 1.12–2.35), while the use of hand sanitisers suggested a positive association (aPR = 2.57, 95% CI: 0.72–9.17). Cleaners with contact dermatitis were more likely to report using natural rubber latex gloves (aPR = 1.61, 95% CI: 1.29–2.01). Overall, exposure to specific cleaning products (floor cleaners and bleach), frequent handwashing, and use of latex gloves were significant work-related predictors of contact dermatitis among hospital cleaners.

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Table 3: Work-related factors associated with contact dermatitis

Work-related factors	n (%)	Univariate		Multivariable	
		PR (95% CI)	p-value	PR (95% CI)	p-value
Hospital					
Hospital 4	37 (11.4)	Ref			
Hospital 3	39 (12.1)	1.81 (1.02-3.22)	0.043	1.81 (1.01-3.23)	0.045
Hospital 2	53 (16.4)	2.29 (1.35-3.88)	0.002	2.22 (1.29-3.79)	0.004
Hospital 1	194 (60.1)	1.56 (0.93-2.62)	0.093	1.55 (0.91-2.63)	0.105
Cleaning duration in hospital setting (years)					
≤1	168 (52.0)	Ref			
2 – 3	87 (26.9)	1.08 (0.82-1.41)	0.583	1.07 (0.82-1.40)	0.606
>3	68 (21.1)	1.22 (0.93-1.59)	0.147	1.18 (0.89-1.55)	0.258
Use of floor cleaning products					
No	74 (22.9)	Ref			
Yes	249 (77.1)	1.74 (1.22-2.50)	0.002	1.70 (1.18-2.44)	0.004
Use of bleach					
No	180 (55.7)	Ref			
Yes	143 (44.3)	1.65 (1.22-2.22)	0.001	1.64 (1.22-2.22)	0.001
Use of glass-cleaning products					
No	318 (98.4)	Ref			
Yes	5 (1.6)	1.23 (0.78-1.93)	0.372	1.29 (0.80-2.08)	0.296
Frequent handwashing					
No	69 (21.4)	Ref			
Yes	254 (78.6)	1.68 (1.17-2.42)	0.005	1.63 (1.12-2.35)	0.010
Use of hand sanitisers					
No	53 (16.4)	Ref			
Yes	270 (83.6)	2.69 (0.76-9.50)	0.124	2.57 (0.72-9.17)	0.146
Use of latex gloves					
No	204 (63.2)	Ref			
Yes	119 (36.8)	1.59 (1.28-1.97)	<0.001	1.61 (1.29-2.01)	<0.001

Each prevalence ratio is derived from a separate regression model, presented both unadjusted and adjusted for age, sex, and level of education.

PR: Prevalence ratio; CI: Confidence interval.

Discussion

This study investigated the prevalence and determinants of contact dermatitis among hospital cleaners in four referral hospitals in Dar es Salaam. This study revealed a high prevalence of contact dermatitis among hospital cleaners, with itching, dry skin, and rashes being the most common symptoms. Individual characteristics such as age, sex, education, smoking, and allergy history were not significantly associated with contact dermatitis. Instead, occupational exposures emerged as the main predictors. In particular, the use of floor cleaning products and bleach, frequent handwashing, and the use of natural rubber latex gloves were positively associated with contact dermatitis. Together, these findings underscore the central role of work-related factors, rather than personal susceptibility, in driving the burden of contact dermatitis among hospital cleaners in this setting.

In this study, nearly half (48.9%) of hospital cleaners reported symptoms consistent with contact dermatitis, a prevalence similar to that reported (52.1%) in Ethiopian hospital cleaners 8 but higher than that reported in other healthcare settings in sub-Saharan Africa and other parts of the world, where estimates range from 12.3% to 31.5%[3,10,15]. A lower prevalence (18.9%) was also reported in a tertiary hospital in western India[16], which may be partly attributable to methodological differences: Gupta and colleagues[16] confirmed cases using dermatological examination and patch testing, whereas our study relied on self-reported symptoms, a method that may capture a broader spectrum of cases and therefore yield higher estimates. The elevated prevalence observed in our study may also reflect intensified infection prevention and control measures that persisted beyond the COVID-19 pandemic (our data were collected in 2022), during which healthcare workers, including cleaners, used stronger cleaning agents, washed and sanitised their hands more frequently[17]. These findings underscore the substantial dermatological burden faced by hospital cleaners.

Cleaners in Hospitals 2 and 3 experienced a significantly higher prevalence of contact dermatitis compared with those in Hospital 4. This variation may reflect differences in workload, protective equipment, and infection control practices. Similar between-facility variability has been reported elsewhere. In Southern Africa, substantial differences in work-related skin symptoms were reported

between hospitals, linked to differences in cleaning practices and training[3]. A study in Brunei Darussalam 18 reported a 1-year prevalence of 19% for self-reported skin disorder symptoms among healthcare workers, with higher odds in those exposed to disinfectants and latex gloves, highlighting how facility-level differences in exposure contribute to variation. In Canada[19], disinfecting tasks doubled the odds of hand dermatitis, with bleach use identified as a significant predictor, emphasizing the role of institutional cleaning protocols and product choice. Taken together, these findings suggest that institutional policies, cleaning protocols, and the availability of protective resources are key determinants of between-hospital differences in occupational skin health.

The use of bleach was a significant predictor of contact dermatitis in our study, consistent with its role as a potent irritant. Sodium hypochlorite compromises the stratum corneum by removing surface lipids, altering skin pH, and increasing transepidermal water loss, which collectively weaken the epidermal barrier and facilitate dermatitis[20]. This mechanism is evident in occupational settings: a case of hand eczema directly linked to bleach used for surface disinfection has been reported[21], and in a Canadian cross-sectional survey[19], bleach was the only cleaning agent significantly associated with hand dermatitis among HCWs. A previous systematic review further confirmed that chlorine-based products, including bleach, are among the most common occupational risk factors for contact dermatitis in professional cleaners globally[9]. The positive association observed in our study between contact dermatitis and the use of floor-cleaning products is likely driven by bleach, which is used very frequently for cleaning floors in these hospitals[2]. Collectively, these findings highlight the central role of bleach as an occupational hazard for cleaners and healthcare staff.

Frequent handwashing was another significant factor in our analysis. This finding is consistent with a recent systematic review and meta-analysis which showed that washing hands at least 8–10 times daily increased the relative risk of hand eczema by 51%[22]. A clear dose–response was also observed, with 15–20 daily washes associated with an even higher risk[22]. Similar associations have been documented in pandemic-related studies, where intensified hand hygiene led to rising rates of occupational hand eczema among healthcare workers worldwide[23,24]. Repetitive wet work strips the protective surface film from the stratum corneum, weakening the barrier and predisposing to irritant dermatitis, particularly in settings where access to moisturisers is limited.

We observed a positive trend (though non-statistically significant) for alcohol-based hand sanitiser use. This aligns with the recent meta-analysis which found no significant association between alcohol rub use and hand eczema risk, suggesting the view that alcohol rubs are generally less damaging than repeated soap-and-water washing[22]. Experimental studies confirm that alcohol formulations cause less barrier disruption than detergents[25], although some HCWs perceive them as harsher[26]. Misuse, such as applying alcohol rub to wet skin, can still contribute to hand eczema[27]. Overall, alcohol rubs appear safer for skin health than frequent handwashing, but risk remains with excessive use or in the absence of adequate skin care.

The positive association we observed between latex glove use and contact dermatitis is well supported by dermatological and occupational evidence. Gloves are a common cause of both irritant and allergic contact dermatitis, particularly due to chemical accelerators such as thiurams, dithiocarbamates, and benzothiazoles used in glove manufacturing[28,29]. A previous case series also documented HCWs whose hand eczema was confirmed by patch testing to result from glove accelerators[30]. Prolonged glove wear further exacerbates the risk, as occlusion increases moisture and heat, impairs barrier recovery, and intensifies irritation from other exposures[31]. This evidence substantiates our finding that latex glove use is a strong risk factor for contact dermatitis among cleaners and HCWs.

Contrary to expectations, individual factors such as age, sex, education level, smoking, and allergy history were not significantly associated with contact dermatitis in our study. This finding aligns with a systematic review that found no pooled evidence linking sex to irritant contact dermatitis in occupational settings[11]. Similarly, a Southern African study reported that although allergy showed an association with skin symptoms in unadjusted analyses, work-related factors were the main predictors of risk[3]. Evidence from Ethiopia suggests that allergy can be an important predictor of contact dermatitis[10]. However, the lack of association with allergy history in our study is consistent with broader evidence showing that irritant contact dermatitis, rather than allergic mechanisms, predominates among cleaners and other wet-work occupations[32]. While some studies have reported higher risks among women, attributed to both occupational roles and greater symptom reporting[4,12], our findings suggest that in this setting, workplace exposures rather than individual characteristics are the primary drivers of dermatitis risk.

This study is one of the few that have examined contact dermatitis among hospital cleaners in Tanzania[3]. However, it is not without limitations. Contact dermatitis was identified through self-reported questionnaire data without confirmation by clinical examination or tests such as patch testing. This approach introduces the possibility of misclassification, either from underreporting or exaggeration of symptoms. Nonetheless, we believe this did not significantly affect the study findings, as a standardized questionnaire was used. Self-reports may also be influenced by recall bias, although efforts were made to minimize this through interviewer training and clarification of questions. The absence of objective exposure assessment limited the ability to quantify the concentrations of chemical agents or other specific exposure metrics. Moreover, the cross-sectional design precludes causal inference. Despite the limited generalisability of the findings to other settings, the study provides valuable and context-specific evidence on the epidemiology of contact dermatitis in the workplace, data that remain scarce and essential for informing preventive strategies in low- and middle-income countries.

Conclusions

In conclusion, this study demonstrated a high prevalence of contact dermatitis among hospital cleaners, with its occurrence largely associated with occupational exposures, particularly bleach, floor-cleaning agents, frequent handwashing, and latex glove use. These findings underscore the urgent need for targeted preventive strategies, including substituting hazardous products with safer alternatives, adopting less irritant cleaning practices, and ensuring the provision of emollients. Implementing comprehensive skin protection programs tailored specifically to hospital cleaners could substantially reduce the burden of contact dermatitis

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and enhance both worker health and productivity. Future studies should incorporate detailed exposure assessment and objective clinical measures, such as dermatological examinations and patch testing, to enhance the accuracy of diagnosis.

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