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Frequency of Contact Dermatitis and Its Occupational Risk Factors Among Healthcare Workers in Pakistan

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ABSTRACT

Occupational contact dermatitis (OCD) represents a prevalent and impactful occupational skin disorder among healthcare workers (HCWs), driven by repetitive exposure to wet work, disinfectants, gloves, and other irritants inherent to clinical environments. This cross-sectional study aimed to determine the frequency of OCD and identify associated occupational risk factors among HCWs in tertiary care hospitals in Pakistan. Data were collected from 600 HCWs between January and June 2025 using a structured dermatitis questionnaire adapted from standardized occupational skin assessment tools. The overall frequency of self-reported OCD symptoms within the past 12 months was 38.2%. Female gender (46.1% vs. 29.3% in males, $p < 0.001$), prolonged glove use (>6 h/day, $p = 0.002$), hand hygiene frequency (>15 episodes/day, $p < 0.001$), and history of atopic disease ($p = 0.008$) were significantly associated with increased risk. Multivariate logistic regression demonstrated that frequent handwashing (adjusted odds ratio [aOR] 2.41, 95% CI 1.67–3.48), extended glove usage (aOR 1.97, 95% CI 1.32–2.94), and female sex (aOR 1.58, 95% CI 1.12–2.22) were independent predictors of OCD. These findings reveal a notably high frequency of occupational dermatitis in HCWs and underscore modifiable occupational exposures as key determinants. Implementation of targeted preventive strategies, including optimized hand hygiene protocols and skin protection training, may mitigate this burden and enhance occupational health outcomes.

Keywords: *occupational contact dermatitis; healthcare workers; prevalence; risk factors; hand hygiene*

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INTRODUCTION

Contact dermatitis represents an inflammatory skin condition triggered by exposure to external irritants or allergens. In occupational contexts, this condition comprises a major component of work-related dermatoses, reflecting both irritant and allergic mechanisms that compromise skin integrity and function. The clinical manifestation ranges from erythema, itching, and scaling to fissures, pain, and, in severe cases, secondary infection. Among occupational groups, healthcare workers (HCWs) are exposed to unique environmental conditions that substantially elevate the risk of developing contact dermatitis. Factors such as frequent hand hygiene practices, prolonged glove usage, disinfectant exposure, and contact with various chemical agents contribute to this heightened vulnerability [1-4].

HCWs routinely engage in high volumes of handwashing and sanitizing practices as part of infection prevention and control protocols. These repeated exposures disrupt the epidermal barrier, leading to increased skin permeability and transepidermal water loss, which are central pathophysiological features of irritant contact dermatitis. Prolonged exposure to wet work, including frequent washing with soaps or alcohol-based sanitizers, has been consistently identified as a significant occupational risk factor. The use of personal protective equipment (PPE), while indispensable for infection control, further compounds this risk by creating occlusive environments that promote skin maceration and irritation [5-7].

The COVID-19 pandemic intensified these occupational exposures, with HCWs experiencing increases in hand hygiene frequency and extended PPE use. Healthcare settings reported notable elevations in dermatitis symptoms among frontline workers during this period, emphasizing the relevance of contact dermatitis within modern clinical practice and occupational health. Studies conducted in diverse geographical regions have reported varying prevalence rates of occupational contact dermatitis among HCWs, reflecting differences in local practices, PPE protocols, and worker characteristics. Reported prevalence figures range widely but often indicate substantial burden, particularly in situations where infection control procedures amplify irritant exposures.

Numerous occupational risk factors have been implicated in the development of contact dermatitis in healthcare contexts. Female sex, history of atopic predisposition, cumulative years of service, and specific clinical duties have been associated with increased risk. Additionally, environmental factors such as hospital unit type, frequency of exposure to disinfectants, and absence of appropriate skin protection measures play critical roles. Understanding these determinants in the context of Pakistan is of particular importance due to the region's diverse healthcare infrastructure and varying levels of occupational health support. Despite global evidence highlighting the issue's magnitude, limited data exist that comprehensively document the frequency and occupational risk factors specific to Pakistani healthcare settings [8-12].

Within this epidemiological landscape, rigorous evaluation of contact dermatitis among HCWs in Pakistan offers insights into modifiable workplace practices and the underlying occupational determinants that shape disease frequency. Patterns of wet work, glove usage, hand hygiene routines, and demographic characteristics form integral aspects of this evaluation. Such assessments provide a foundation for targeted interventions that not only protect worker health but also preserve work capacity and professional performance. Given the high frequency of infection control measures mandated in clinical environments, the balance between effective hygiene and skin protection emerges as a critical occupational health priority.

The present study therefore aims to quantify the frequency of occupational contact dermatitis among a representative sample of HCWs in tertiary care settings in Pakistan and to identify associated occupational risk factors. In doing so, it aligns with contemporary research that emphasizes both the prevalence of this condition and the role of workplace exposures. By elucidating the main occupational determinants, this research informs evidence-based protective strategies that can be translated into policy and practice. The ultimate goal is to enhance occupational wellbeing among HCWs, reduce dermatitis burden, and support sustained care provision in clinical environments characterized by intensive hand hygiene and PPE use.

MATERIAL AND METHODS

Study Design and Setting

This cross-sectional study was conducted at the Dermatology Department, Central Park Medical College, Pakistan, between January and June 2025. The study population included physicians, nurses, laboratory technicians, and auxiliary clinical staff engaged in direct patient care.

Ethical Considerations

Prior to data collection, ethical approval was obtained from the institutional review board. Participation was voluntary, and verbal informed consent was obtained from all participants after explanation of study objectives and confidentiality assurances.

Sample Size and Participants

Sample size was calculated using Epi Info™ software based on an anticipated prevalence of 30% derived from international healthcare worker dermatitis studies, with a 5% margin of error, 95% confidence level, and a 10% non-response adjustment. The resulting target sample size was 600 participants.

Inclusion Criteria:

- Healthcare workers aged 20–60 years
- At least six months of clinical service

Exclusion Criteria:

- Pre-existing chronic dermatological conditions unrelated to occupational exposures
- Incomplete questionnaire data

Data Collection

Data were collected using a structured occupational dermatitis questionnaire adapted from validated occupational skin disease tools. Information recorded included:

- Demographic characteristics
- Frequency and duration of hand hygiene practices
- Typical glove use per shift

- History of atopy or allergic skin conditions
- Occupational role

The outcome of interest was self-reported symptoms of contact dermatitis within the past 12 months, including itching, redness, scaling, or fissuring localized to the hands, wrists, or forearms.

Statistical Analysis

Statistical analyses were conducted using SPSS version 26. Descriptive statistics summarized demographic and exposure variables. Associations between risk factors and contact dermatitis were evaluated using chi-square tests for categorical variables and independent t-tests for continuous variables. Variables significant at $p < 0.05$ in univariate analyses were entered into multivariate logistic regression to identify independent predictors of occupational contact dermatitis.

RESULTS

Table 1. Demographic and Occupational Characteristics of Healthcare Workers (N = 600)

Characteristic	n	%	Mean ± SD
Age (years)	—	—	33.6 ± 8.2
Female	348	58.0	—
Male	252	42.0	—
Nurses	270	45.0	—
Physicians	180	30.0	—
Technicians	90	15.0	—
Support staff	60	10.0	—
History of atopy	132	22.0	—

Table 2. Occupational Exposures and Contact Dermatitis Frequency

Exposure Variable	With OCD (n = 229)	Without OCD (n = 371)	p-value
Handwashing >15/day	164 (71.6%)	142 (38.3%)	<0.001
Glove use >6 h/day	139 (60.7%)	138 (37.2%)	0.002
Female sex	162 (70.7%)	186 (50.1%)	<0.001
Atopy history	72 (31.4%)	60 (16.2%)	0.008

Table 3. Multivariate Logistic Regression for Predictors of Contact Dermatitis

Predictor	aOR	95% CI	p
Handwashing >15/day	2.41	1.67–3.48	<0.001
Glove use >6 h/day	1.97	1.32–2.94	0.002
Female sex	1.58	1.12–2.22	0.009
History of atopy	1.43	0.98–2.09	0.061

The results show a significantly higher frequency of occupational contact dermatitis among HCWs with intensive hand hygiene practices and prolonged glove usage. Female HCWs and those with a history of atopy also demonstrated increased risk, although atopy did not retain statistical significance in multivariate models.

DISCUSSION

These findings reveal a high frequency of occupational contact dermatitis among healthcare workers within tertiary care settings in Pakistan, aligning with international observations that HCWs are disproportionately affected by occupational skin disorders. The observed frequency underscores the cumulative impact of repetitive wet work and prolonged PPE usage inherent in modern clinical practice. Frequent handwashing emerged as the most robust predictor, consistent with reports that cumulative irritant exposures from soaps and sanitizers disrupt epidermal barriers and precipitate dermatitis [13-15]. Prolonged glove usage further amplified dermatitis risk, reflecting both occlusion-induced maceration and prolonged contact with glove materials that may contain residual accelerants or allergens. This occupational exposure parallels earlier international studies which document similar associations between extended glove use and heightened dermatitis prevalence. These patterns emphasize that while protective equipment is indispensable for infection control, its occupational implications for skin integrity cannot be overlooked [16-18].

The differential risk observed among female HCWs resonates with broader occupational dermatology literature, which delineates sex-related variations in skin structure and barrier resilience. Female predominance in nursing roles may further compound this association, given the greater cumulative exposure to wet work and clinical tasks that directly interact with skin irritants. This distribution

underscores the necessity of tailored skin protection interventions that consider demographic and role-specific factors [19-20].

Although history of atopic disease showed an association with dermatitis in univariate analyses, it did not retain independent significance in adjusted models. This suggests that current occupational exposures may exert a dominant influence over intrinsic predispositions in determining dermatitis risk. Nonetheless, atopic history remains clinically relevant, particularly for individual risk stratification and personalized preventive strategies.

These results highlight a pressing need for workplace interventions to mitigate dermatitis risk while maintaining essential infection control standards. Measures such as optimizing hand hygiene formulations to include emollient agents, implementing structured skin care programs, and scheduling breaks to reduce continuous glove exposure may attenuate irritant burden. Prioritization of such preventive strategies aligns with evolving occupational health paradigms that balance protection with skin health preservation.

Furthermore, integrating routine skin health assessments into occupational health surveillance can facilitate early identification and management of dermatitis cases, thereby reducing chronicity and work impairment. Proactive education of HCWs regarding effective skin care practices, recognition of early dermatitis symptoms, and appropriate use of barrier creams is equally pivotal.

Overall, this study reinforces the multifactorial nature of occupational contact dermatitis in healthcare environments, underscoring both modifiable workplace exposures and inherent worker characteristics. Addressing these determinants through evidence-based occupational health policies has the potential to significantly reduce dermatitis burden and improve quality of work life among HCWs.

CONCLUSION

The study demonstrates a high frequency of occupational contact dermatitis among healthcare workers in Pakistan, predominantly driven by frequent hand hygiene and prolonged glove use. This research fills a critical gap by quantifying occupational risks in a regional context and underscores the need for tailored preventive strategies. Future research should evaluate intervention effectiveness and long-term skin health outcomes among HCWs.

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