JIMKI
JURNAL ILMIAH
MAHASISWA KEDOKTERAN
INDONESIA
e-ISSN : 2721-1924 p-ISSN : 2302-6391

Penelitian Asli

Factors Associated with the Incidence of Hand Dermatitis Among Car and Motorcycle Wash Workers in East Padang District

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Abstract

Introduction: *Hand dermatitis is a skin disorder resulting from repeated exposure to irritants or allergens and commonly occurs in occupations involving intensive contact with detergents and cleaning agents. Car and motorcycle washing workers have a high risk of skin damage due to such exposure. This study aimed to identify factors associated with the occurrence of hand dermatitis among workers in East Padang District.* ***Methods:*** *An analytical observational study with a cross-sectional design was conducted on 32 workers selected through simple random sampling. Data were collected through direct interviews using a validated questionnaire. Univariate and bivariate analyses were performed in this study. The chi-square test was used to assess the association between the occurrence of hand dermatitis and variables including length of employment, duration of contact, age, history of atopy, personal hygiene, and use of personal protective equipment (PPE).* ***Results:*** *Hand dermatitis was found in 65.6% of respondents. Bivariate analysis showed significant associations between duration of contact (p=0.020), personal hygiene (p=0.027), and use of PPE (p=0.000) with the occurrence of hand dermatitis. No significant associations were found for length of employment (p=0.798), age (p=0.211), and history of atopy (p=0.637).* ***Discussion:*** *Prolonged contact with irritants, poor personal hygiene practices, and not using PPE contribute to increased damage to the skin barrier. Meanwhile, age and history of atopy appear to have a smaller influence in this working group.* ***Conclusion:*** *Duration of contact, personal hygiene, and use of PPE are significantly associated with the occurrence of hand dermatitis. Length of employment, age, and history of atopy do not show significant associations. Strengthening preventive practices, particularly consistent use of PPE, is strongly recommended.*

Keywords: *Hand dermatitis, Risk factors, Wash workers.*

1. INTRODUCTION

Contact dermatitis is a common inflammatory skin disorder that develops following exposure to environmental irritants or allergens.[1,2] It represents one of the most frequently reported occupational diseases, accounting for a considerable proportion of work-related dermatological conditions.[3] The hands, as the body part most frequently exposed to chemicals, detergents, water, and other environmental agents, are particularly susceptible to repeated irritation.[4] As a result, hand dermatitis can substantially impair work performance, disrupt daily activities, and reduce overall productivity.

Hand dermatitis includes both irritant and allergic subtypes, each characterized by distinct mechanisms and clinical features.[5] Continuous exposure to weak irritants such as detergents, soap, and water gradually damages the stratum corneum, leading to impaired skin barrier function and heightened inflammatory responses.[6] Clinically, this condition ranges from acute symptoms, such as erythema, edema, vesicles, and burning sensations, to chronic manifestations, including fissures, lichenification, and persistent dryness.[4] Occupations involving routine wet work and chemical exposure, such as salon work, metalwork, food processing, cleaning services, and vehicle washing, are known to have high rates of hand dermatitis.[7]

Globally, the burden of contact dermatitis is significant. Surveys report prevalence rates of 1.4% in the United States and 1.2% in the Netherlands, while occupational cases range from 9 to 49 per 100,000 workers annually.[8,9] Variations in prevalence across countries, including rates of 5.7% in the United Kingdom and 49.5% in China, are influenced by climate, occupational exposures, ultraviolet radiation, and diagnostic practices.[10] In Indonesia, national data show that 97% of occupational skin diseases are contact dermatitis, with irritant dermatitis accounting for most cases.[11]

The rapid growth of service industries, including car and motorcycle wash businesses, has increased workers' exposure to detergents, cleaning agents, and automotive lubricants.[12] Workers in this sector experience prolonged exposure to wet work and frequent contact with chemicals, placing them at a high risk of developing hand dermatitis.[13] Poor personal hygiene practices and inconsistent use of personal protective equipment (PPE), such as gloves and protective footwear, further intensify susceptibility to

skin damage.[14] This combination of occupational hazards makes vehicle wash workers a vulnerable population requiring closer investigation.

Hand dermatitis contributes not only to clinical discomfort but also to economic losses, reduced job performance, and increased healthcare needs.[15] Despite its importance, local research examining determinants of hand dermatitis among car and motorcycle wash workers remains scarce. Factors such as exposure duration, length of employment, personal hygiene, atopic history, and PPE usage may influence disease occurrence. However, their impact has not been thoroughly evaluated in this setting. Therefore, this study aims to identify risk factors associated with hand dermatitis among vehicle wash workers in East Padang District, to support preventive strategies and inform occupational health policies.

2. METHODS

Study Design

This study employed a quantitative analytical observational design using a cross-sectional approach. This design was selected to assess the association between occupational exposure factors and the occurrence of hand dermatitis at a single point in time among vehicle wash workers.

Study Setting and Population

The study was conducted at car and motorcycle wash facilities located in East Padang District. Data collection took place from June 2021 to July 2023. The study population comprised all workers employed as car and motorcycle washers in the study area.

Sample Size and Sampling Technique

A total of 32 respondents were included in the study and selected using simple random sampling from the accessible population. This sampling technique ensured that each eligible worker had an equal chance of being selected and minimized selection bias.

Inclusion and Exclusion Criteria

The inclusion criteria were workers who were actively employed at car or motorcycle wash facilities during the study period and were willing to participate by providing informed consent. Workers who were unavailable or could not be reached at the time of data collection were excluded from the study.

Variables

The dependent variable in this study was the occurrence of hand dermatitis. The presence of hand dermatitis was determined through direct interviews and observation, with assistance from

a dermatologist, and categorized as “present” or “absent”.

The independent variables included working period, duration of contact with irritant substances, age, history of atopy, personal hygiene, and use of personal protective equipment (PPE). Working period was defined as the length of time the respondent had been employed as a vehicle wash worker and was categorized as less than 2 years or 2 years and above. Duration of contact referred to the average daily duration of exposure to water, detergents, or cleaning chemicals and was categorized as less than 8 hours per day or 8 hours per day and above.

Age was recorded based on self-report and categorized according to the predefined age groups used in the questionnaire. A history of atopy was defined as a self-reported history of allergic diseases, including allergic rhinitis, asthma, or atopic dermatitis, and categorized as present or absent. Personal hygiene was defined as the respondent’s practices related to maintaining cleanliness during and after work, such as handwashing before and after work, bathing after work, and maintaining nail hygiene, and was categorized as good or poor. Use of PPE was defined as the use of protective equipment during work activities, such as gloves and protective footwear, and was categorized as using PPE or not using PPE.

Data Collection Instrument

Data were collected through direct interviews using a structured anamnesis questionnaire. The questionnaire consisted of closed-ended questions that assessed sociodemographic characteristics, occupational exposure patterns, duration of contact with cleaning agents, personal hygiene practices, use of PPE, and self-reported symptoms of hand dermatitis. The questionnaire was administered by trained interviewers to ensure consistency and completeness of data collection.

Statistical Analysis

Univariate analysis was performed to describe the distribution of each variable. Bivariate analysis was conducted using the chi-square test to assess the association between hand dermatitis and independent variables, including working period, duration of contact, age, history of atopy, personal hygiene, and use of PPE. Statistical analysis was performed using SPSS software, and a p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

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The study obtained ethical clearance before data collection. All respondents provided informed consent, and confidentiality of personal information was maintained throughout the research process.

3. RESULTS

A total of 32 respondents met the inclusion criteria and were included in the analysis (Table 1). Hand dermatitis was identified in 65.6% of the workers, indicating a high burden of occupational skin problems in this population. Most respondents had a working period of less than two years (53.1%) and reported a daily contact duration of eight hours or more (65.6%). The majority were aged 21–30 years (53.1%), had no history of atopy (84.4%), demonstrated poor personal hygiene practices (56.3%), and did not use PPE, such as gloves or protective footwear (56.3%).

Bivariate analysis revealed no significant association between the working period and the occurrence of hand dermatitis (p = 0.798) (Table 1). Workers with less than two years of employment demonstrated similar risk compared to those with longer tenure. Likewise, age was not significantly associated with hand dermatitis (p = 0.211), and the distribution of dermatitis across age categories did not exhibit a consistent pattern (Table 1). No meaningful relationship was observed between atopic history and hand dermatitis (p = 0.637), with both atopic and non-atopic individuals displaying comparable rates of disease (Table 1).

In contrast, the duration of contact demonstrated a significant association with hand dermatitis (p = 0.020). Workers exposed to irritants for eight hours or more per day had a notably higher proportion of dermatitis compared to those with shorter contact durations. Personal hygiene was also significantly related to the condition (p = 0.027), with poor hygiene practices correlating with an increased incidence of hand dermatitis. Furthermore, the use of PPE showed the strongest association (p = 0.000). Workers who did not use protective equipment had a significantly higher prevalence of dermatitis than those who used PPE routinely.

4. DISCUSSION

This study investigated factors associated with the occurrence of hand dermatitis among car and motorcycle wash workers in East Padang District. The findings demonstrate a high prevalence of hand dermatitis, affecting 65.6% of respondents, indicating that this occupational group is particularly vulnerable to skin barrier damage due to repeated exposure to irritants. The prevalence observed

in this study aligns with previous literature, which indicates that occupations involving wet work, detergents, and chemical exposure are associated with higher rates of skin disorders compared to the general population.[4]

The analysis revealed that the working period was not significantly associated with hand dermatitis. This finding suggests that even workers with shorter employment duration are at comparable risk, likely due to immediate and direct contact with irritants inherent in daily tasks. Other studies have reported mixed results. Some studies have found that longer work durations increase the risk due to cumulative exposure, while others, like the present study, have indicated no association.[16-18] The inconsistency across studies may reflect differences in workplace practices, frequency of chemical use, and effectiveness of protective measures.

Age also showed no significant relationship with hand dermatitis. Although aging can influence skin integrity, the relatively young age distribution in this study (with the majority aged 21–30 years) may explain the lack of association between aging and skin integrity. This pattern is supported by findings from other Indonesian and international studies, which reported no clear age-related trend among workers performing high-contact tasks.[18,19] A similar atopic history showed no meaningful association, contrasting with the common assumption that individuals with atopic conditions are more susceptible to irritant dermatitis. Despite the known role of impaired skin barrier function in atopy, the overwhelming exposure to detergents and water in this occupational environment may overshadow individual predisposition.

In contrast, duration of contact demonstrated a significant association with the incidence of hand dermatitis. Workers exposed for eight hours or more each day experienced markedly higher rates of dermatitis compared with those with shorter exposure. This finding is consistent with established evidence that prolonged wet work and repeated interaction with irritants weaken the stratum corneum, disrupt lipid organization, and trigger inflammatory responses.[19] Continuous contact with water and detergents is known to reduce natural moisturizing factors and compromise skin barrier integrity, making irritation inevitable over time.

Personal hygiene also showed a significant association, indicating that poor hygiene practices

contribute to the development of dermatitis. Workers who avoided handwashing after exposure or did not rinse chemical residues promptly were more vulnerable to irritation. This aligns with studies showing that inadequate hygiene habits facilitate prolonged skin contact with irritants, delay barrier recovery, and exacerbate inflammation.[20] Conversely, good hygiene practices help reduce chemical accumulation on the skin, thereby lowering the risk of dermatitis.

The strongest association was observed with the use of personal protective equipment (PPE). Workers who did not use gloves or protective footwear exhibited a significantly higher prevalence of hand dermatitis. This finding is consistent with the existing literature, which asserts that PPE serves as a primary preventive mechanism against occupational skin disorders.[21] Regular use of gloves reduces direct exposure to irritants and moisture, thereby maintaining the skin's protective functions. However, the low rate of PPE use in this study suggests gaps in worker awareness, facility provisions, or employer enforcement of safety measures.
Taken together, these findings highlight that environmental and occupational exposures, particularly prolonged contact duration, poor hygiene, and lack of PPE, are stronger determinants of hand dermatitis than individual factors such as age or atopic predisposition. This highlights the need for preventive interventions that focus on workplace conditions rather than solely on worker characteristics.

Despite its strengths, this study has several limitations. The relatively small sample size limited the statistical power and precluded the use of multivariable analysis, such as logistic regression, to identify independent predictors of hand dermatitis. Consequently, the associations observed were based on bivariate analysis and should be interpreted as unadjusted relationships. The cross-sectional design further restricts causal inference, as exposure and outcome were assessed simultaneously. In addition, the use of self-reported data may have introduced recall bias. Nevertheless, the study provides meaningful preliminary evidence regarding modifiable occupational risk factors, particularly duration of contact, personal hygiene practices, and use of personal protective equipment, and may serve as baseline data for larger studies employing multivariable analytical approaches.

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Table 1. Distribution of Respondent Characteristics and Their Association with Hand Dermatitis

Variable	Category	Hand Dermatitis Present n (%)	Hand Dermatitis Absent n (%)	Total n (%)	p-value
Working Period	< 2 years	15 (83.3)	3 (16.7)	18 (56.3)	0.798
	≥ 2 years	6 (42.9)	8 (57.1)	14 (43.7)	
Duration of Contact	< 8 hours/day	4 (36.4)	7 (63.6)	11 (34.4)	0.020
	≥ 8 hours/day	17 (81.0)	4 (19.0)	21 (65.6)	
Age	≤ 20 years	5 (100)	0 (0)	5 (15.6)	0.211
	21–30 years	10 (58.8)	7 (41.2)	17 (53.1)	
	> 30 years	6 (60.0)	4 (40.0)	10 (31.3)	
Atopic History	Present	4 (80.0)	1 (20.0)	5 (15.6)	0.637
	Absent	17 (63.0)	10 (37.0)	27 (84.4)	

5. CONCLUSION

These findings emphasize the importance of improving worker education on skin protection, promoting consistent PPE use, and implementing workplace regulations aimed at minimizing irritant exposure. These actions are crucial for mitigating the burden of hand dermatitis and improving worker safety in the vehicle wash industry.

6. RECOMMENDATION

- Ensure consistent PPE use, especially waterproof gloves, by improving availability and enforcing workplace safety policies.
- Provide regular training on irritant exposure, proper handwashing, and early recognition of hand dermatitis.
- Reduce prolonged contact with water and detergents through task rotation or scheduled breaks.
- Promote good hygiene practices by providing clean water, mild cleansers, and encouraging immediate rinsing after exposure.

- Support skin protection by supplying moisturizers or barrier creams to help maintain skin integrity.
- Strengthen occupational health monitoring to identify early symptoms and provide timely management.

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