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Analysis Of Factors Related To Dermatitis Among Laundry Workers In Pedurungan District, Semarang

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Abstract

The skin acts as a protective barrier for the body, but excessive exposure can cause occupational dermatitis, especially in women. WHO data states that 10% of cases of irritant contact dermatitis were occupational. Laundry businesses in Semarang also increase this risk. The aim of this study was to analyze factors associated with dermatitis among laundry workers in Pedurungan District, Semarang. This study used a quantitative method with a cross-sectional design, with a sample of 117 respondents selected through accidental sampling. Data were collected using a structured questionnaire. Data analysis used the Spearman Rank test. The results showed that the average age of respondents was 37.77 years. Most respondents were female (77.8%) and had a high school education (70.9%). The average work duration was 9.92 hours per day. There were relationship between the use of personal protective equipment ($p<0.014$; $r=-0.226$), the use of chemicals ($p<0.001$; $r=0.569$), and chemical exposure (<0.001; $r=0.661$) with contact dermatitis. There was no relationship between length of service and personal hygiene. The use and exposure to high levels of chemicals increase the risk of contact dermatitis, so the use of personal protective equipment and good personal hygiene can reduce the risk of contact dermatitis.

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Introduction

The skin protects the body from physical, chemical, and biological environmental elements. Excessive exposure can damage the skin and cause diseases, such as occupational dermatitis (Hadi dkk., t.t.), which can occur in anyone and on any part of the body (Siregar IJ dkk., 2024), Contact dermatitis is an inflammatory reaction due to direct contact with irritants or allergens, either acutely or chronically (Warahmah M, 2020). Causes are divided into direct, such as the nature of the substance, and indirect, such as age and gender (Fithrotun Nada dkk., 2022). Based on data from the World Health Organization (WHO), irritant contact dermatitis in 2020 reached 10% and ranked 4th, contributing 80% of total occupational diseases. There are around 300 million new cases each year (Hayati dkk., 2022). In 2019, 1,016 cases of occupational dermatitis were recorded, with 86% experiencing contact dermatitis, the majority of whom were women (Yanti & Allo, 2023). Based on the 2018 Basic Health Research, the prevalence of dermatitis in Indonesia reached 6.8% (Badan Penelitian dan Pengembangan Kesehatan, 2018). Skin disease is the third most common in the country (Andani Abdullah & Prasetya, 2020), with 147,953 cases in 2020, of which 122,076 were dermatitis. Cases were more common in women (73,500) than in men (48,576). Most dermatitis is caused by occupational factors, with 90% of cases related to contact with irritants and allergies (Hayati dkk., 2022). According to the 2018 Basic Health Research, the prevalence of dermatitis in Central Java reached 79.5% (Prayogo dkk., 2024). A 2016 survey showed that 66.3% of patients suffered from irritant contact dermatitis (Novianti U & Wahyuningsih AS, 2024). Skin diseases account for 9% to 34% of total occupational disease cases (Fithri dkk., 2019). Data from the Semarang City Community Health Center (Puskesmas) in 2023 recorded 179,834 cases of allergic contact dermatitis (Dinas Kesehatan Kota Semarang, 2023). The prevalence of irritant contact dermatitis varies, particularly among laundry workers exposed to detergents. More than 20% of cases each year are caused by detergents. High-risk workers include domestic workers and cooks (Fauziyyah, 2020).

Research by Nani Rianingrum found that laundry workers exposed to irritants for more than 8 hours are at risk of developing irritant contact dermatitis. The longer the work period and the duration of contact, the greater the chance of skin irritation. Poor hygiene habits also increase the risk of dermatitis. Laundry workers often complain of itching and redness due to exposure to chemicals such as detergents and fabric softeners (Rianingrum dkk., 2021). According to research by Nina Eka Yuliana, high humidity and temperature can cause dermatitis. A safe humidity range is between 40% and 60%. Humidity below 40% can cause dehydration and irritation, while humidity above 70% can trigger fungus and allergies (Eka Yuliana dkk., 2021). Retno Mareintika stated that inadequate use of Personal Protective Equipment (PPE) can lead to chemical dermatitis. This is caused by improper glove use and a lack of information about the importance of PPE (Mareintika, 2022). Garmini revealed that workers who do not understand the importance of PPE tend to ignore workplace hazards. Laundry workers often underestimate complaints of irritant contact dermatitis due to a lack of education, which leads to unawareness of the dangers (Garmini R, 2018).

Laundry businesses are growing rapidly in large cities and benefit both service users and businesses. However, there are negative impacts such as an increased risk of dermatitis for workers due to continuous contact with detergents and fragrances that can irritate the skin (Fauziyyah, 2020). In Pedurungan District, Semarang City, there are 110 laundry businesses, with 83 conventional units employing labor and 27 self-service units where customers wash themselves. Based on observations and interviews at three laundry businesses in Pedurungan District, Semarang City, it was found that five workers were frequently exposed to high concentrations of chemicals, which increased the risk of irritant contact dermatitis. At Cika Laundry, two workers experienced symptoms such as itching and a burning sensation on the skin after working for 9 hours with more than 10 washes per day. Non-compliance with wearing personal protective equipment was caused by discomfort and a lack of understanding of the importance of PPE. Two other laundries experienced similar problems, with workers exposed for 6 to 9 hours per day. Factors such as high workloads and unhealthy behaviors also contributed to the increase in dermatitis. The aim of this study was to analyze factors associated with dermatitis among laundry workers in Pedurungan District, Semarang.

Methods

This study used a quantitative method with a cross-sectional design approach. The independent variables used in this study were work period, chemical use, chemical exposure, personal hygiene, and use of personal protective equipment (PPE). The dependent variable in this study was the incidence of contact dermatitis among laundry workers in Pedurungan District, Semarang City. The population in this study consisted of 83 conventional laundry businesses located in Pedurungan District, Semarang City. Based on calculations using the Slovin formula, the sample size was 117 people. The sampling technique used was accidental sampling. Data collection techniques in this study used a valid and reliable questionnaire. Researchers conduct interviews and provide consent forms to respondents. Data processing consists of editing, coding, scoring, data entry, data cleaning, tabulating, and data presentation. Data analysis includes several stages, namely the normality test to evaluate data distribution, univariate tests to describe the characteristics of each variable statistically, and bivariate tests using Spearman's Rank to analyze the relationship between two variables.

Results

Table 1 shows the characteristics of research respondents. The maximum age of respondents is 69 years, while the minimum age is 17 years. The average age of respondents is 37.77 years, the middle value (median) of respondents' age is 38 years and the most frequently appearing value (mode) is 45 years. The duration of respondents' work in one day is a minimum of 4 hours of work and a maximum of 15 hours of work. The average (mean) duration of respondents' work is 9.92 hours per day. The median or middle value of respondents' work duration is 10 hours, while the mode or most frequently appearing value is 12 hours.Tabel 2. Distribusi frekuensi jenis kelamin

Tabel. 1 Characteristic of Respondents

Variabel	Total	Min	Max	Mean	Median	Modus
Age	117	17	69	37,77	38	45
Work duration	117	4	15	9.92	10	12

Table 2 shows that the majority of respondents in this study were female, namely 91 people with a percentage of 77.8% and male respondents numbered 26 people with a percentage of 22.2%. The frequency distribution of respondents' education levels shows that the majority of respondents were high school graduates, with 83 respondents representing 70.9%. Meanwhile, the lowest number of respondents was a diploma, with 2 respondents representing 1.7%. The maximum length of service for respondents was 20 years, while the minimum length of service was 1 year. The average length of service was 3.2 years, with a median of 2 years. The mode, the most frequently occurring length of service among

respondents, was 1 year. The length of service in this study was 79 people (67.5%) who had a work period of less than 2 years, while the remaining 38 people (32.5%) had a work period of 2 years or more.

Table 2 Distributiion of Gender, education, and length of service

Category	F (n)	Procentage (%)
Gender		
Male	26	22,2
Female	91	77,8
Education		
Elementary	5	4,3
Junior	20	17,1
Senior	83	70,9
DIPLOMA	2	1,7
Bachelor	7	6
Lengt of service		
<2 Years	79	67,5%
≥2 Years	38	32,5%
Total	117	100

Table 3 shows that the score for the use of personal protective equipment (PPE) by respondents had a minimum value of 9 and a maximum of 23. The average (mean) score for the use of PPE was 16.20, with a middle (median) value of 16. And the mode value, namely the score that appeared most frequently, was 17.

Table 3 Distribution of PPE, Personal Hygiene, Chemical use, Chemical Exposure, and Dermatitis Incidence

PPE use	Frekuensi (n)	Procentage (%)
<16	59	50,4
≥16	58	49,6
Personal Hygiene		
<26	67	57,3
≥26	50	42,7
Chemical Use		
<10	64	54,7
≥10	53	45,3
Chemical Exposure		
<10	62	53
≥10	55	47
Dermatitis		
<12	75	64,1
≥12	42	35,9
Total	117	100

The results show that as many as 59 respondents with a percentage of 50.4% are in the low category, and as many as 58 respondents with a percentage of 49.6% are in the high category. Respondent characteristics based on personal hygiene, it is known that the minimum personal hygiene score of respondents is 17 and the maximum score is 32. The average personal hygiene score is 25.73, while the middle value (median) is 26. The mode value or the score that appears most frequently is 27. Of the total 117 respondents, 67 respondents with a percentage of 57.3% were included in the low category, and 50 respondents with a percentage of 42.7% were included in the high category. Respondent characteristics based on chemical use, it is known that the minimum score is 6 and the maximum score is 16. The average score for chemical use by respondents is 10.15, with a middle value (median) of 10. The mode value or the score that appears most frequently is 11.

The results show the distribution of the frequency of chemical use, it is known that the median value of the respondents' chemical use score is 10. Of the total 117 respondents, as many as 64 respondents with a percentage of 54.7% are included in the low category and as many as 53 respondents with a percentage of 45.3% are included in the high category. Respondent characteristics based on chemical exposure, it is known that the minimum score for chemical exposure is 8 and the maximum is 16.

The average score for chemical exposure experienced by respondents is 10.72, with a middle value (median) of 10. The mode value or the score that appears most frequently is 10.

Of the total 117 respondents, 62 respondents with a percentage of 53% were included in the low category, and 55 respondents with a percentage of 47% were included in the high category. The contact dermatitis score experienced by respondents had a minimum value of 8 and a maximum of 16. The average (mean) dermatitis score was 11.81, while the middle (median) value was 12. The mode value or the score that appeared most frequently was also 12. Of the total 117 respondents, 75 respondents with a percentage of 64.1% were included in the low category, and 42 respondents with a percentage of 35.9% were included in the high category.

Table 4 shows that The Spearman Rank test showed a p-value of 0.061 (p > 0.05), indicating no relationship between length of service and the incidence of contact dermatitis in laundry workers. A correlation coefficient of -0.174 indicates a weak negative relationship, indicating that the longer the length of service, the lower the incidence of contact dermatitis. The Spearman Rank test results showed a p-value of <0.014 (p <0.05), indicating a relationship between the use of Personal Protective Equipment (PPE) and the incidence of contact dermatitis among laundry workers in Pedurungan District. The correlation coefficient value of -0.226 indicates a negative relationship with weak strength, meaning that the better the use of PPE, the lower the incidence of contact dermatitis.

Table 4 Distribution of factors related to Dermatitis

Independent Variables	Dependent Variable	Statitical test	P-Value	r	
Length of work	Dermatitis	Rank Spearman test	0,061	-0,174	No Relationship
Using PPE			<0,014	-0,226	Significant
Personal Hygiene			0,156	-0,132	No Relationship
Chemical Use			<0,001	0,569	Significant
Chemical Exposure			<0,001	0,661	Significant

The Spearman Rank test results showed a p-value of 0.156 (p > 0.05), indicating no relationship between personal hygiene and the incidence of contact dermatitis in laundry workers. A correlation coefficient of -0.132 indicates a weak negative relationship, indicating that better personal hygiene leads to lower incidences of contact dermatitis. The Spearman Rank test results showed a p-value of <0.001 (p <0.05), indicating a relationship between chemical use and the incidence of contact dermatitis in laundry workers. The correlation coefficient of 0.569 indicates a strong positive relationship, indicating that the more frequent chemical use, the higher the risk of contact dermatitis. The Spearman Rank test results showed a p-value of <0.001 (p <0.05), indicating a relationship between chemical exposure and the incidence of contact dermatitis in laundry workers. The correlation coefficient of 0.661 indicates a strong positive relationship, indicating that the higher the level of chemical exposure, the greater the incidence of contact dermatitis.

Discussion

Characteristic of Respondents

Age is not a major risk factor for irritant contact dermatitis, but it does influence it because with age, skin becomes drier and more susceptible to irritation from chemical exposure (Rianingrum dkk., 2021)(Warahmah M, 2020). Based on this, the majority of respondents in this study were female (91 people), while 26 were male. According to the Australian Journal of Dermatology, the main causes of irritant contact dermatitis in women are water, wet work, soap, and detergents, while in men it is caused by exposure to heat, oil, coolants, and solvents. In terms of education level, 83 respondents (70.9%) were high school graduates, while the fewest were Diploma 2 graduates (1.7%). A person's education influences their understanding and awareness of occupational safety, including the prevention of diseases such as contact dermatitis. Education influences understanding and awareness of occupational safety and disease prevention. Lower education can reduce awareness of chemical hazards, particularly in the laundry sector (Ernawati Rahayu, 2024).

The minimum work duration is 4 hours and the maximum is 15 hours, with an average of 9.92 hours, a median of 10 hours, and a median of 12 hours. Based on these data, work duration is the number of hours a worker works per day. Working hours exceeding 8 hours can increase the risk of contact dermatitis from irritants. In Pedurungan District, laundry workers work an average of 9 hours, with most working 12 hours a day. Research by Nani Rianingrum showed that 30 respondents worked for 8 hours or more, and longer work hours increased the risk of skin irritation (Rianingrum dkk., 2021). The majority of

laundry workers had less than 2 years of service. Newer workers are more susceptible to contact dermatitis due to lack of experience, safety knowledge, and skin adaptation to chemicals. The risk tends to decrease with longer work experience (Susilawati & Lestari, 2023).

Respondents' personal protective equipment (PPE) use scores ranged from 9 to 23, with a mean of 16.20, a median of 16, and a mode of 17. Of the 117 respondents, 59 (50.4%) were in the low PPE use category, and 58 (49.6%) were in the high PPE use category. This aligns with research by Ma'arij Harfadli, Cut Keumala, and Umi Sholikah in Coblong District, which indicated a lack of PPE provision from business owners and low worker awareness (Ma dkk., 2023). Of the 117 respondents, 67 (57.3%) had low levels of personal hygiene, while 50 (42.7%) had high levels. Increased awareness of certain hygiene aspects is still needed to reduce the risk of dermatitis among laundry workers. Research by Usaha Satria Pratama Tarigan, Viktor Edward Marbun, Evfy Septriani Ginting, and Pitto Pratiwi Malau Muhraza Siddiq also showed that laundry workers' hygiene was suboptimal (Satria dkk., 2025).

Chemical use scores ranged from 6 to 16, with a mean of 10.15, a median of 10, and a mode of 11. Of the 117 respondents, 64 (54.7%) were categorized as low exposure because not all were directly involved in the laundry process; some only ironed or used fragrances. Bleach was used only upon customer request, while detergent and soap were the primary ingredients. Detergent and soap are common ingredients in laundry laundry. Soap is made from organic materials, while detergent is made from the chemical reaction of hydrocarbons and sulfuric acid. Bleach is often used (Pelealu dkk., 2015). Of the 117 respondents, 45.3% used high amounts of chemicals, indicating that many workers were directly involved in the laundry. Such as excessive use of detergents and bleach without reading labels, which increases the risk of irritant contact dermatitis. Sixty-two respondents (53%) experienced low exposure, and 55 respondents (47%) were in the high category.

Several factors influencing low exposure include: not all workers are exposed continuously and do not engage in all activities. Exposure varies depending on the worker's duties. Research by Indah Permata Sari, Dian Mardi Safitri, Winnie Septiani, and Bambang Cholis Su'udi revealed that the large number of clothes washed increases chemical exposure. Repeated and long-term chemical exposure can increase the risk of dermatitis in laundry workers (Sari dkk., 2023). For dermatitis, scores ranged between 8 and 16, with a mean of 11.81, and a median and mode of 12. Seventy-five respondents (64.1%) were in the low category, and 42 respondents (35.9%) were in the high category. The severity of dermatitis varies depending on the job task, the level of exposure, and suboptimal skin adaptation and prevention efforts. This variation indicates that even if symptoms are mild, the risk remains and can progress to more severe conditions if exposure continues unchecked. Irritant contact dermatitis is a non-immunological inflammatory reaction of the skin to irritating substances. Common causes are chemicals such as detergents. Symptoms include irritation, burning, scaling, itching, dryness, cracking, redness, and a rash (Menteri Ketenagakerjaan Republik Indonesia, 2014).

Factors Related to Dermatitis

The Spearman Rank test results indicate that the longer the length of service, the lower the incidence of contact dermatitis. This finding aligns with research conducted by Nani Rianingrum, Cornelis Novianus, and Rina Khairunnisa Fadli in Cipondoh District, Tangerang City, which showed no relationship between length of service and irritant contact dermatitis, with a p-value of 0.467 (Rianingrum dkk., 2021). Furthermore, research by Andi Tenriola Fitri Kessi, Muhammad Akbar Salcha, and Muh. Qizas Afandi Umar also supports these findings. They stated that workers with longer work experience tend to have better skin resilience due to adaptation to irritants, increased knowledge and skills in risk management, and the implementation of safer and more efficient work practices. Thus, although long work periods theoretically increase the duration of exposure to irritants, experienced workers are actually less likely to experience skin disorders such as contact dermatitis, due to protective factors that develop over time (Kessi dkk., 2021).

The results of the Spearman Rank test indicate that better PPE use leads to lower incidences of contact dermatitis. This finding aligns with research by Alfreda Parisya Saputro, Sri Darnoto, and Dwi Astuti, which showed a relationship between compliance with PPE use and the incidence of dermatitis. Even when workers comply with PPE use, dermatitis still occurs if the PPE is incomplete or damaged. As many as 76.2% of workers were recorded as using incomplete PPE. Chemicals such as sodium carbonate and sodium bicarbonate used in the leather industry are similar to those used in laundry and can trigger dermatitis without proper PPE protection (Parisya Saputro dkk., 2024).

The Spearman Rank test results indicate that better personal hygiene leads to a lower incidence of contact dermatitis. This finding aligns with research conducted by Nani Rianingrum, Cornelis Novianus, and Rina Khairunnisa Fadli, which showed no relationship between personal hygiene and irritant contact dermatitis. Although proper handwashing is an important part of prevention efforts, poor hygiene habits,

such as not changing work clothes or not cleaning the skin after exposure to chemicals, can still exacerbate skin irritation experienced by workers (Rianingrum dkk., 2021).

The Spearman Rank test results indicate that higher levels of chemical use increase the risk of contact dermatitis. This aligns with research by Eka Rosanti, Edwina Rudyarti, and Mochammad Azel Putra Sunda Diwa, which demonstrated a relationship between chemicals and irritant contact dermatitis among workers at PT. X. Contact with chemicals causes dermatitis because they are irritants that trigger skin reactions. The more frequent and intense their use, the greater the risk of contact dermatitis. To control this hazard, administrative controls such as chemical use policies and appropriate safety procedures are necessary (Rosanti dkk., 2018). Another study by M. Aldo Wijaya and colleagues showed a similar finding regarding laundry workers. Chemicals can irritate the skin, especially surfactants in detergents and bleaches, which can cause dermatitis if not managed properly. The use of environmentally friendly organic soaps can reduce this risk (Kedokteran dan Kesehatan dkk., 2022).

The results of the Spearman Rank test showed that the higher the chemical exposure, the greater the incidence of contact dermatitis. This finding aligns with research by Siti Sri Muliana showing a relationship between chemical exposure and irritant contact dermatitis in Suka Mulya Village. High levels of exposure can increase the risk of skin disorders, which are influenced by the duration and frequency of contact with chemicals. The more frequently and longer a person is exposed to these substances, the greater the potential impact on skin health (Muliana, 2021).

Conclussion

Based on research in Pedurungan District, Semarang City regarding contact dermatitis in laundry workers, several conclusions were obtained. First, respondents were aged between 17 and 69 years, with an average of 37.77 years and the majority were female. Most respondents had a high school education and worked an average of 9.92 hours per day, with 67.5% of them working for less than 2 years. Second, the results of the Spearman Rank test showed a relationship between the use of personal protective equipment, chemical use, and chemical exposure with the incidence of contact dermatitis. Meanwhile, there was no significant relationship between length of service (p-value >0.061) and personal hygiene (p-value >0.156). Recommendations from this study include, for laundry business owners to provide proper personal protective equipment and educate workers about the dangers of chemicals, as well as regulate working hours according to regulations. Laundry workers are advised to protect themselves more with protective equipment, maintain personal hygiene, and comply with the rules on chemical use. Future researchers are advised to examine other factors that can influence contact dermatitis. This study is also expected to serve as a reference for related institutions.

Author Contributions

Reihan Nuraiza; “Conceptualization, methodology, validation, formal analysis, Ratih Pramitasari; writing—original draft preparation, writing—review and editing, visualization, supervision. All authors have read and agreed to the published version of the manuscript.”

Institutional Review Board Statement

In this section, you should add the Institutional Review Board Statement and approval number, if relevant to your study. You might choose to exclude this statement if the study did not require ethical approval. Please note that the Editorial Office might ask you for further information. Please add “The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of NAME OF INSTITUTE (protocol code XXX and date of approval).” for studies involving humans. OR “The animal study protocol was approved by the Institutional Review Board (or Ethics Committee) of NAME OF INSTITUTE (protocol code XXX and date of approval).” for studies involving animals. OR “Ethical review and approval were waived for this study due to REASON (please provide a detailed justification).” OR “Not applicable” for studies not involving humans or animals.

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